



MA2340 – A Round-Trip Through a Real-Life Autodesk Workflow

Scott Moyse

Design Manager – SMI Group

3000



MA2340 – A Round-Trip Through a Real-Life Autodesk Workflow

Scott Moyse

Design Manager – SMI Group

Class Summary

Autodesk® PLM 360 to Autodesk® Inventor® to Autodesk® Simulation software with data managed by Autodesk® Vault then closing the loop back to PLM 360.

Have you ever wondered if people actually employ a full workflow from concept to completion using several Autodesk tools, software and solutions along the way?

Come and learn how it's done with Scott Moyse and John Evans from the Design & Motion blog.

Learning Objectives

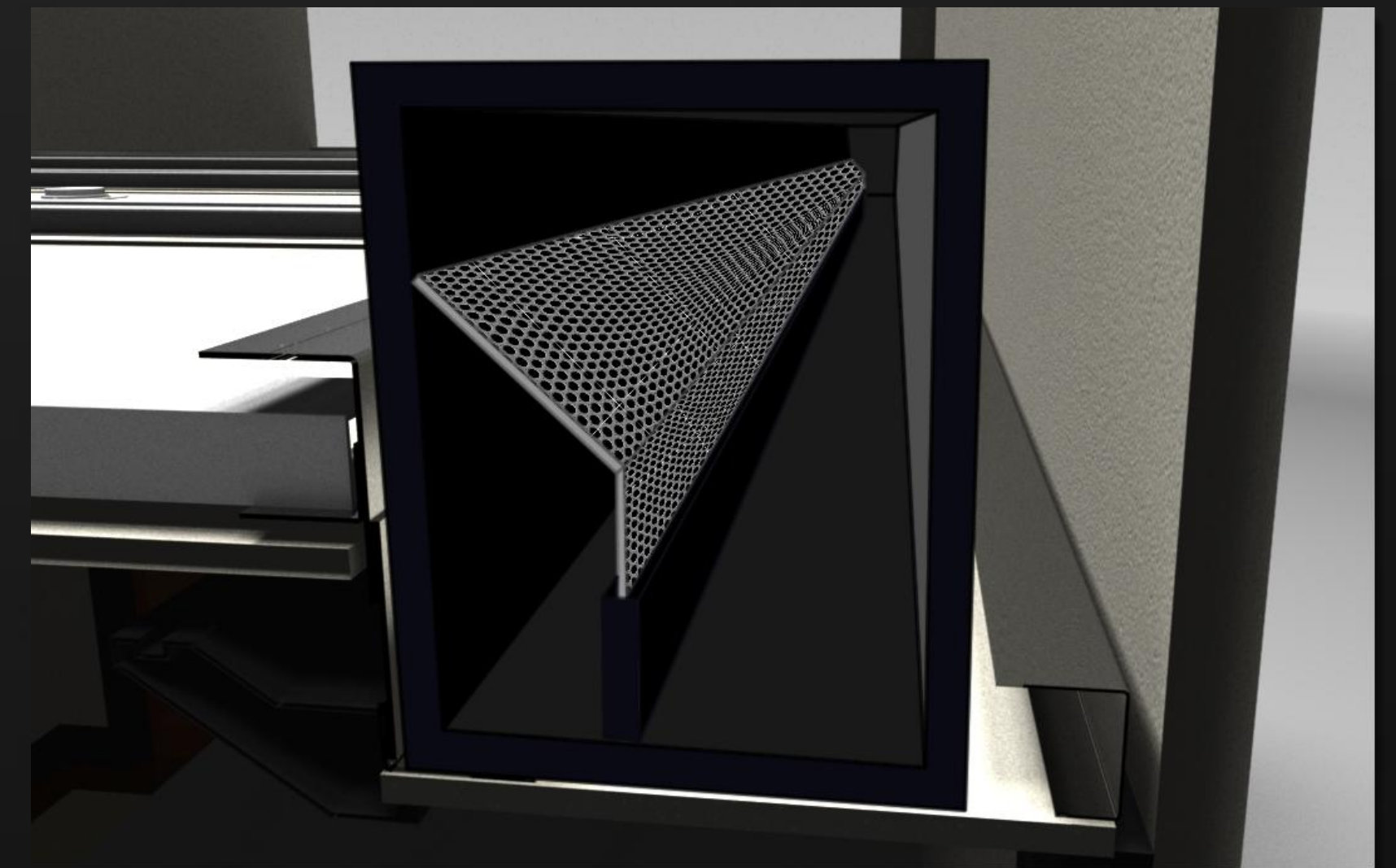
At the end of this class, you will be able to:

- Create a digital prototype in Autodesk Inventor considering CAE requirements
- Learn how to use some of Autodesk's CAE tools to improve & validate your designs
- Manage the entire project from concept to completion with offsite collaboration using Autodesk PLM 360
- Store & manage versions of the design, simulation & visualization data using Autodesk Vault Professional

Introduction

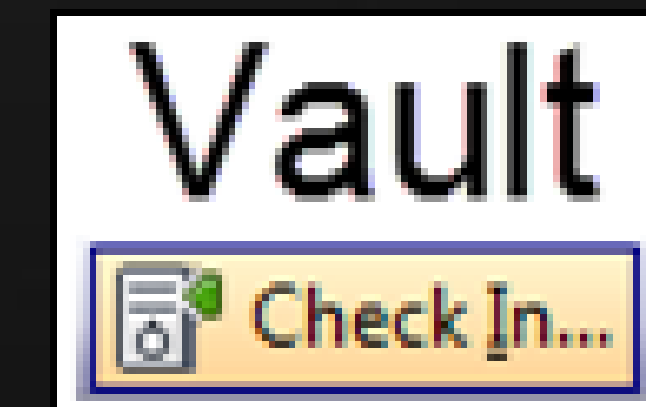
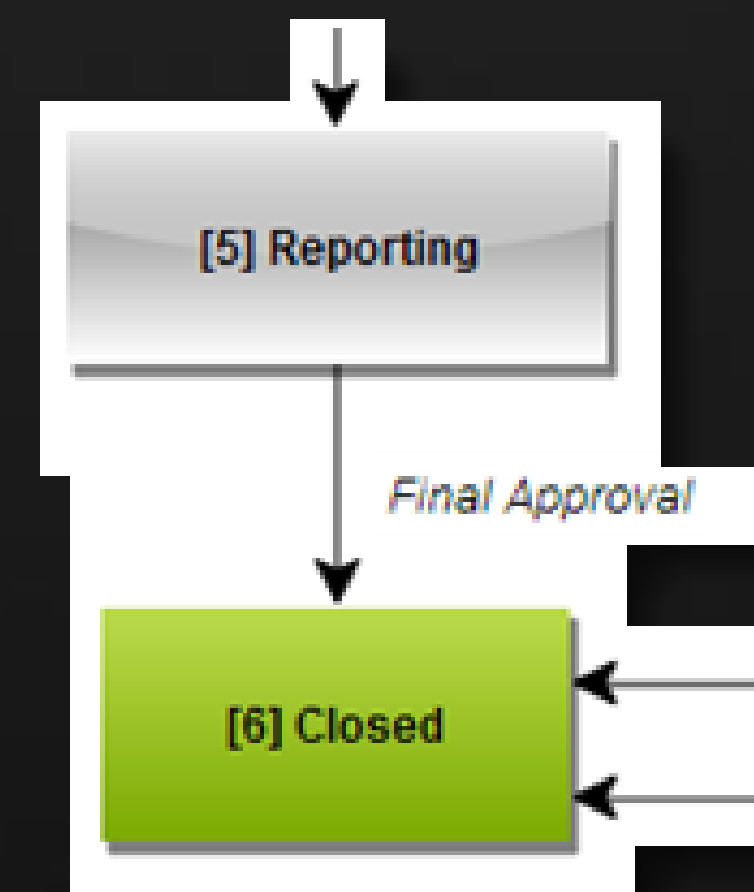
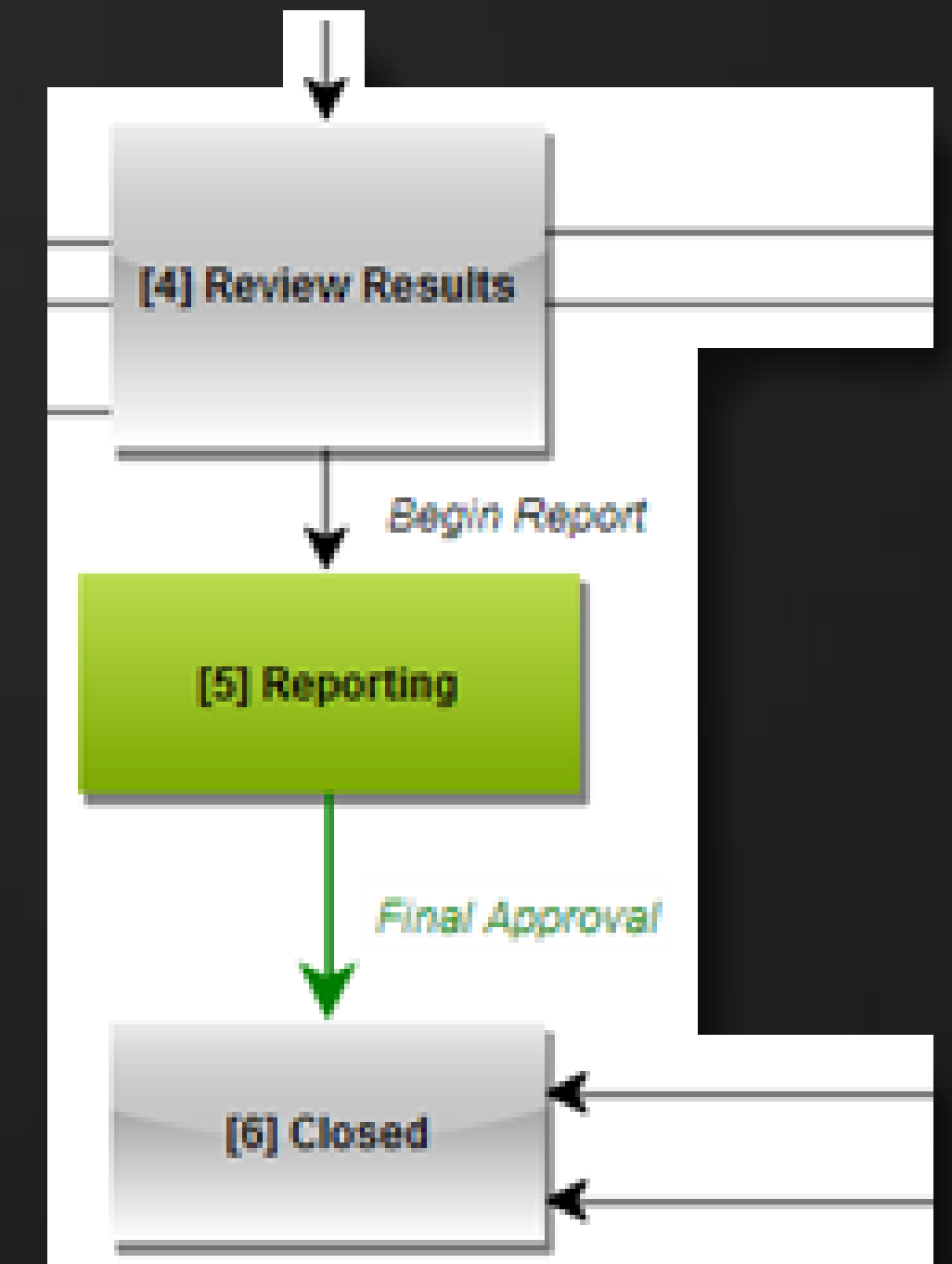
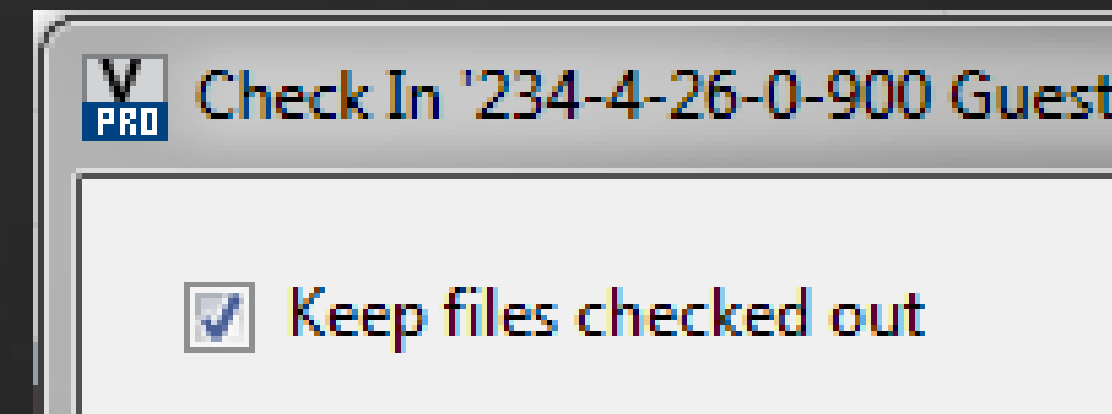
Design Brief

- Super Yacht Air Conditioning System Simulation
- 120m Giga Yacht – Class requirements, space, acoustics, performance
- Find the best Baffle & Diffuser configuration
- Ease of Manufacture
- Collaboration across continents & time zones



Handout Icons

- Handout is a detailed reference, it may not follow the presentation precisely
- These Icons will be used for repeat processes
- Their meaning will be explained the first time they're used.



Ideation & Concepts

Initial Requirements

- Specifications supplied by our client
- Stored in Vault
- Use PLM 360 to communicate requirements
- PLM Requirements record controlled by DCO

The screenshot displays the Autodesk PLM 360 web interface. At the top, the header shows 'Autodesk® PLM 360' and user information 'Admin Moyse'. Below the header is a navigation bar with 'Main Menu', 'Reports', 'Tools', and 'Administration'. The main content area is titled 'Requirements' and shows a specific requirement: 'RE000019 - Client's performance specs - Customer [REV:1]'. The requirement is in an 'Active' state, with a revision of 'Active 1' dated '22/09/2012 3:22:58 PM'. Below this, there are tabs for 'Item Details', 'Derived Requirements (0)', 'Derived From (0)', 'Specifications (3)', and 'Relationships (4)'. The 'Item Details' tab is selected, showing a table with the following information:

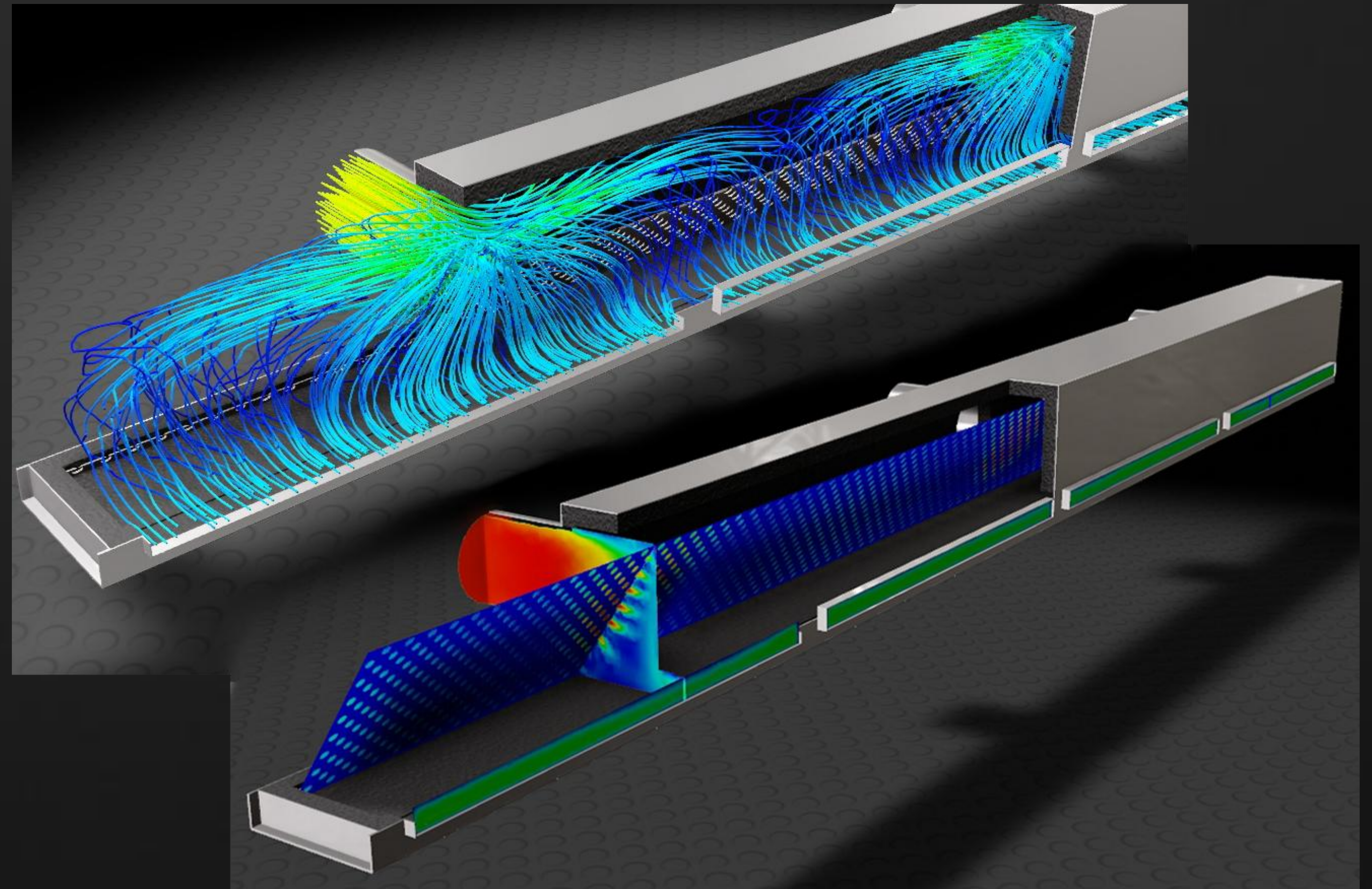
Requirement Details (1 of 1)	
Requirement ID	RE000019
Source	Customer
Importance	Should
Short Name	Client's performance specs
Description	Boat specifications for airflow environment *(Fresh Air Supply 462m3/hr @ max velocity of 5 m/s) Client's boat requirements Vent Manufacturer's analysis SMI Requirements 3 different designs to be simulated

At the bottom of the interface, there is a footer with copyright information: '© Copyright 2012 Autodesk, Inc. All rights reserved. Privacy Policy Terms and Conditions' and the 'Autodesk® PLM 360' logo.

An inset window is shown in the foreground, titled 'Link this item to...'. It contains two options: 'Document Change Order' and 'Requirements'. A red arrow points from the 'Document Change Order' option to the 'Affected Items' button, which is highlighted with a blue starburst icon.

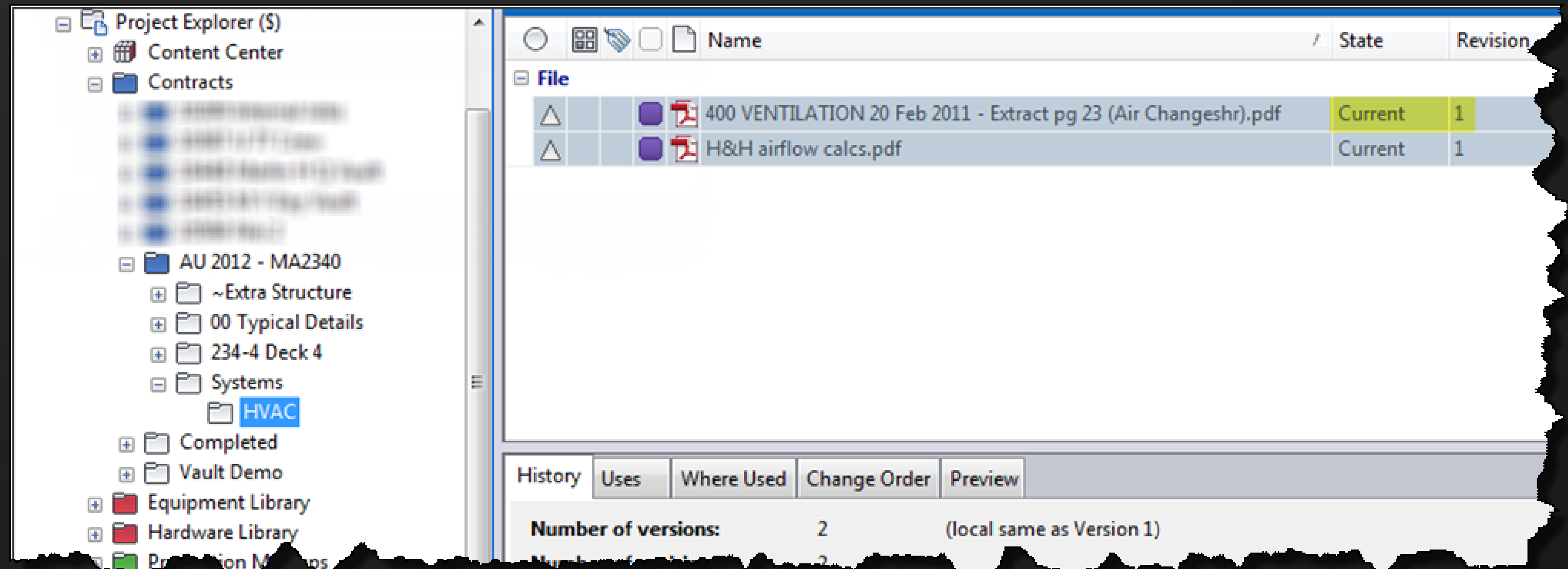
Initial Requirements

- 462 m³/hour
- Max Supply Velocity of 5m/s into the Plenum
- Max Exhaust air velocity of 4m/s
- Max Velocity outside of Air ducts is 3.5m/s



Initial Requirements

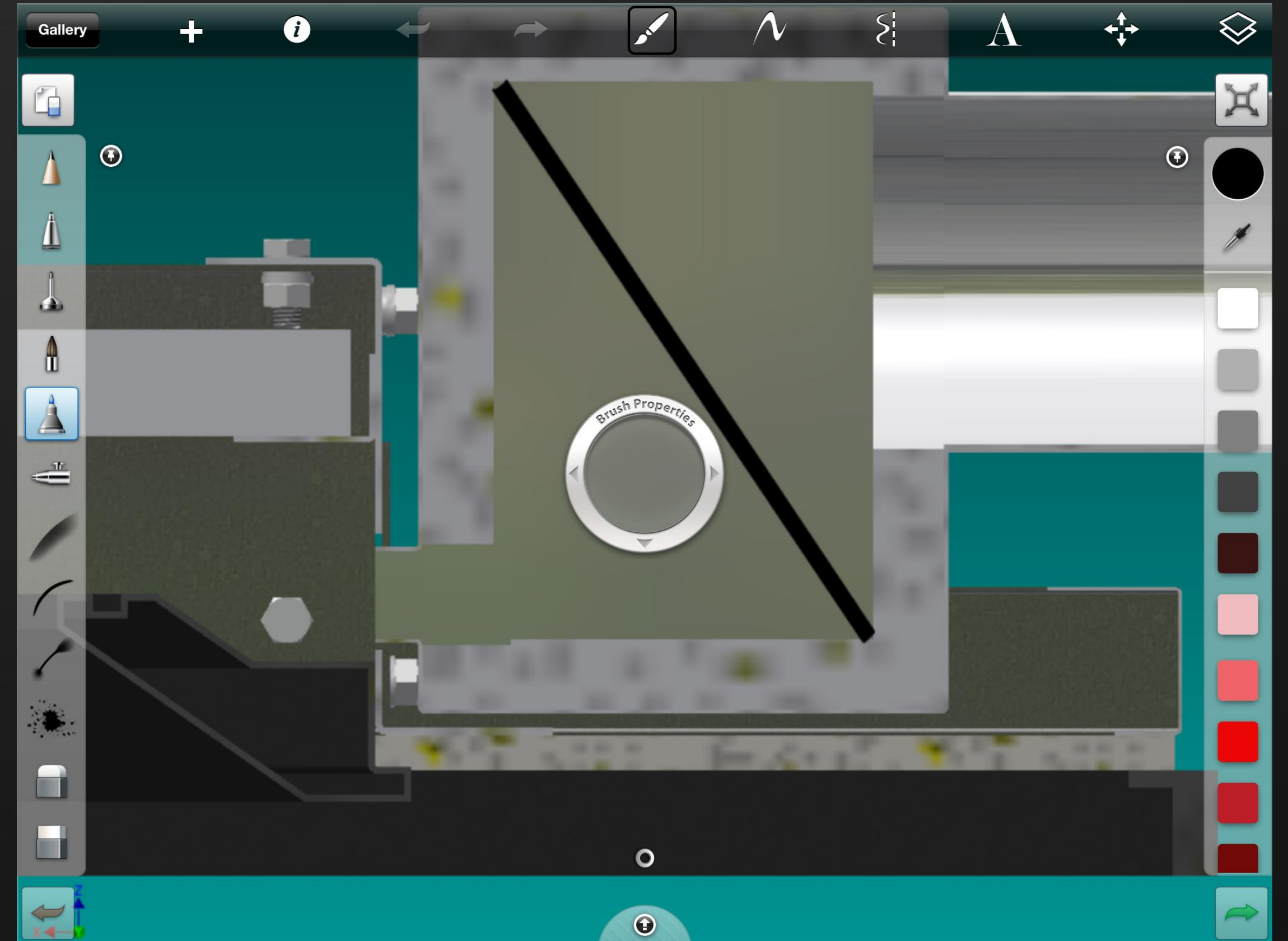
- Check In specifications into Vault
- Drag & Drop
- Check In via application Add-In
- Change Category if needed
- From now on we will use this icon



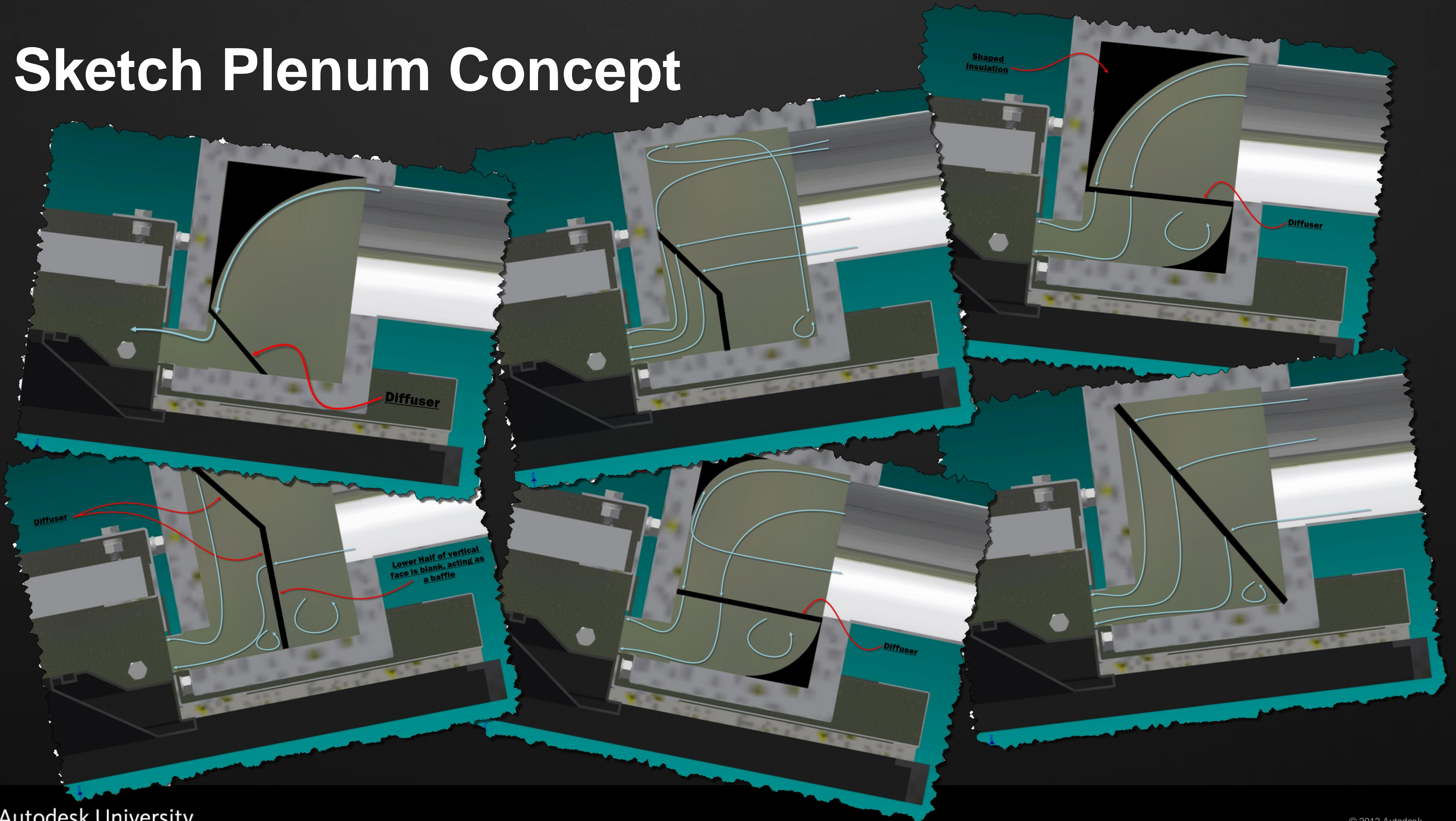
PLM 360 Requirements video here

Sketch Plenum Concept

- Overall location & dimensions are already defined
- Sketchbook Pro Mobile vs Desktop – Vectors etc
- Use Layers for different concepts
- 6 Layer Limit, Save Copy for more concepts
- Used Snagit to visualise predicted air flow

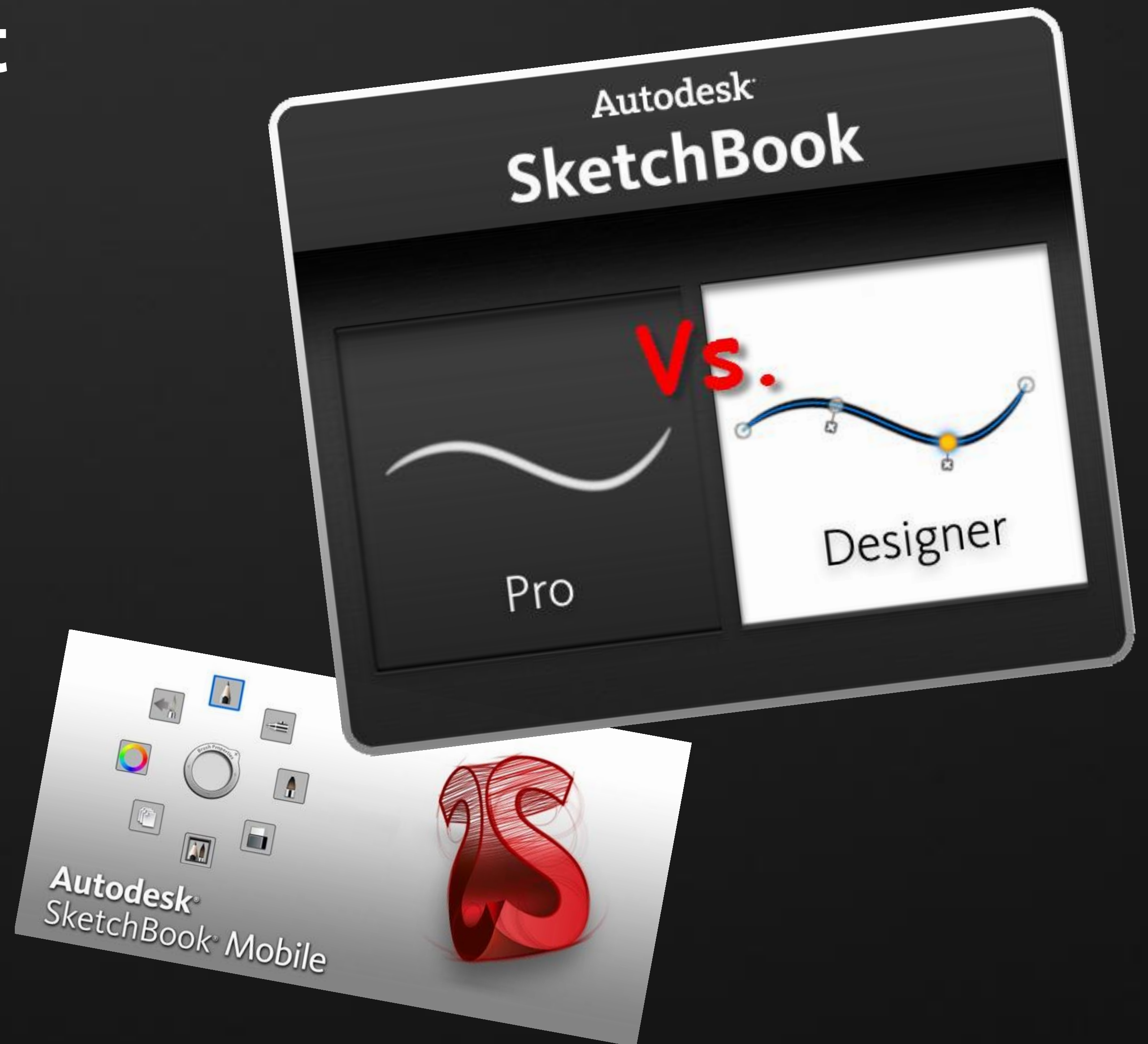


Sketch Plenum Concept



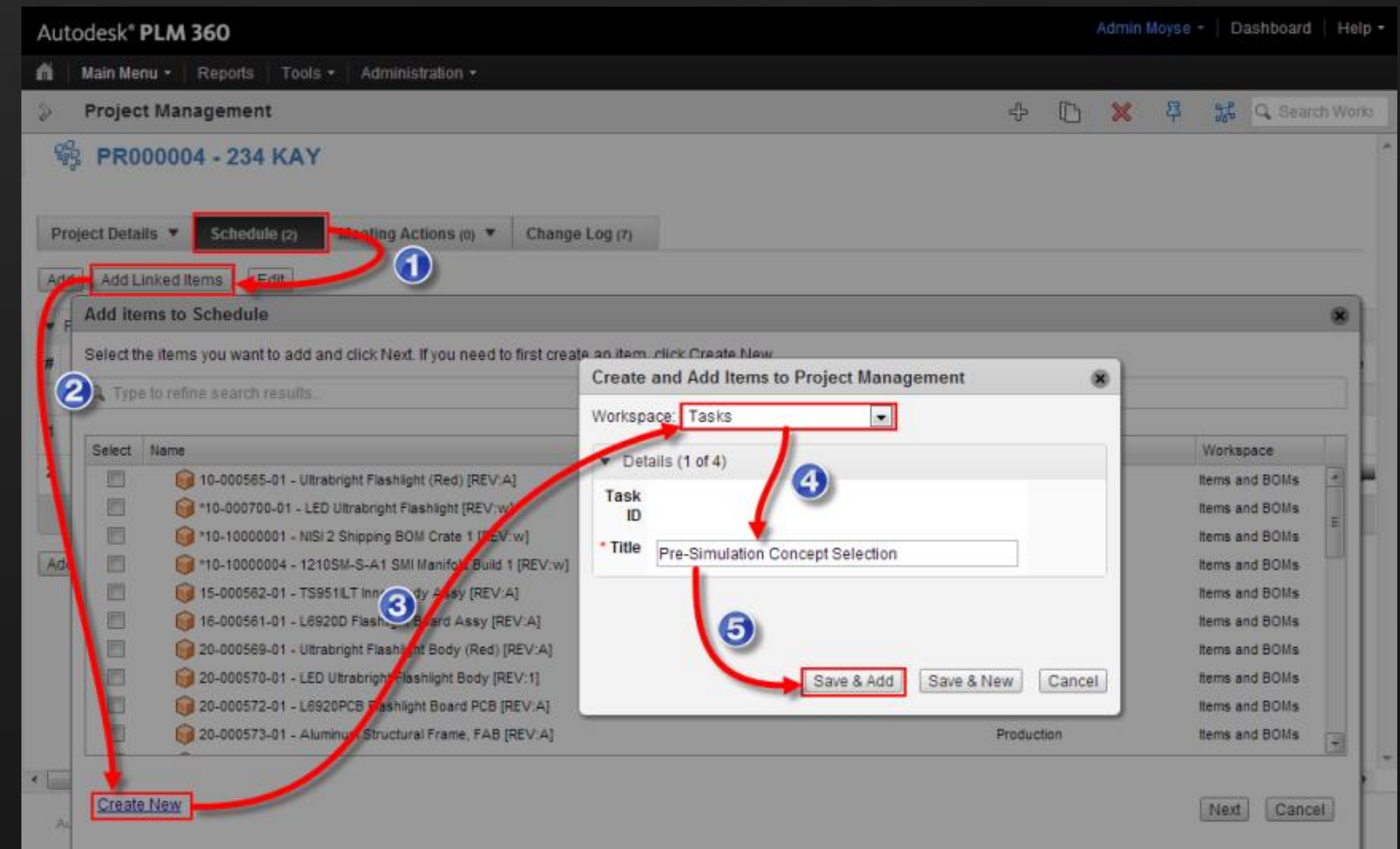
Sketch Plenum Concept

- Email SBM Pro images
- Save them into Vault workspace
- Drag & Drop into Vault Explorer
- Sketchbook Pro – no need to email
- Sketchbook Designer – Non compatible DWG's



PLM 360 Concept Collaboration

- Involve Sim Sub-Contractor in concept selection
- Use PLM 360 Task assignment
- Upload concepts as attachments
- Provide Instructions in Item Details
- Sub Contractor uses Workflow

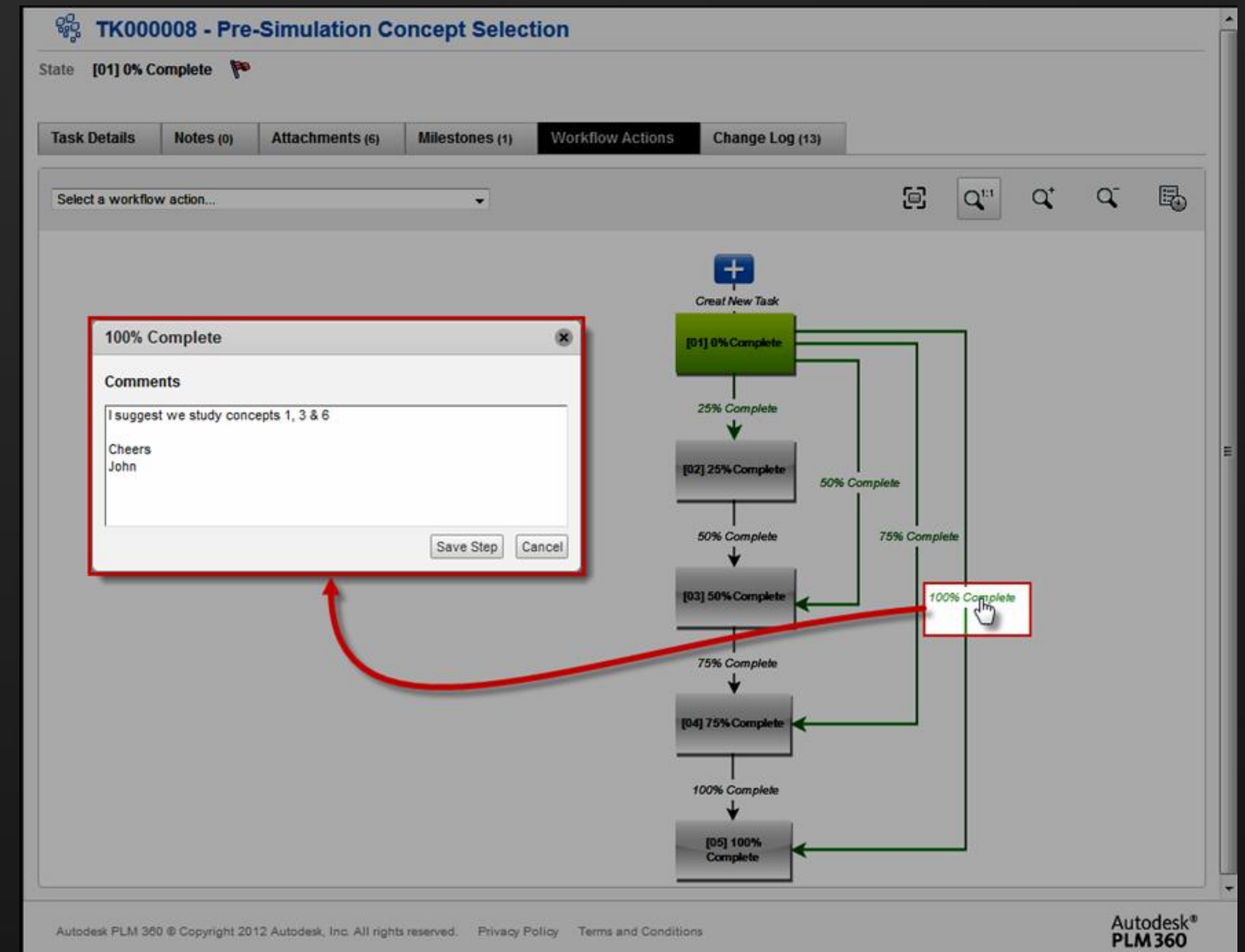


PLM 360 Concept Collaboration

- Concept collaboration video

PLM 360 Concept Collaboration

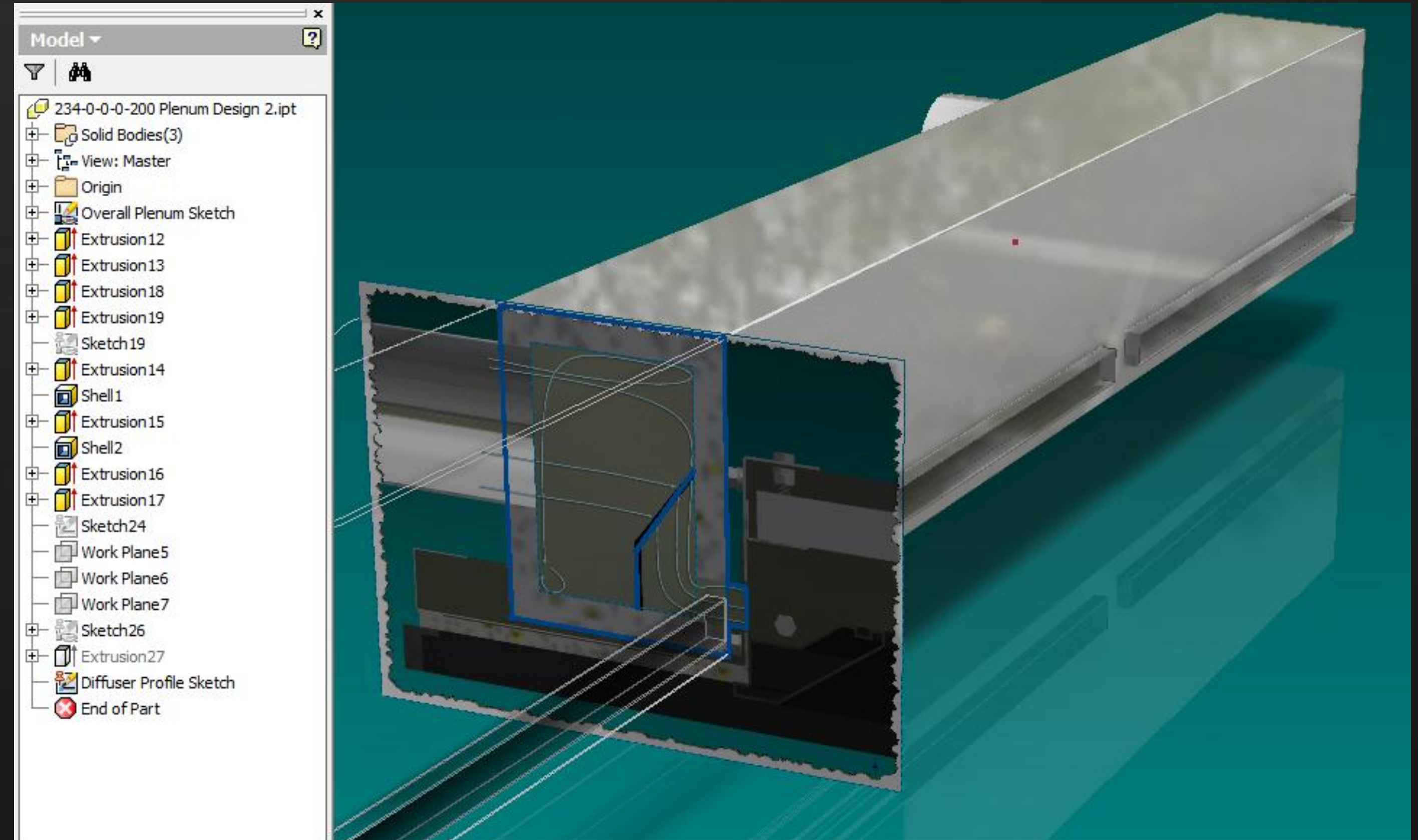
- Contractor reviews task
- Downloads & reviews images
- Change WF State to Complete
- Add comments & decision on transition



Inventor modelling

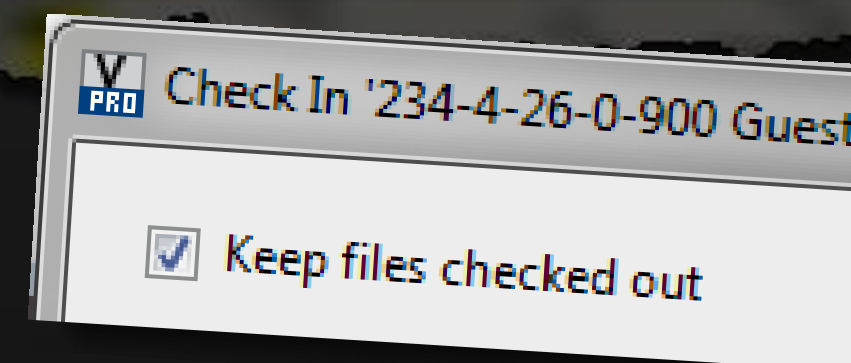
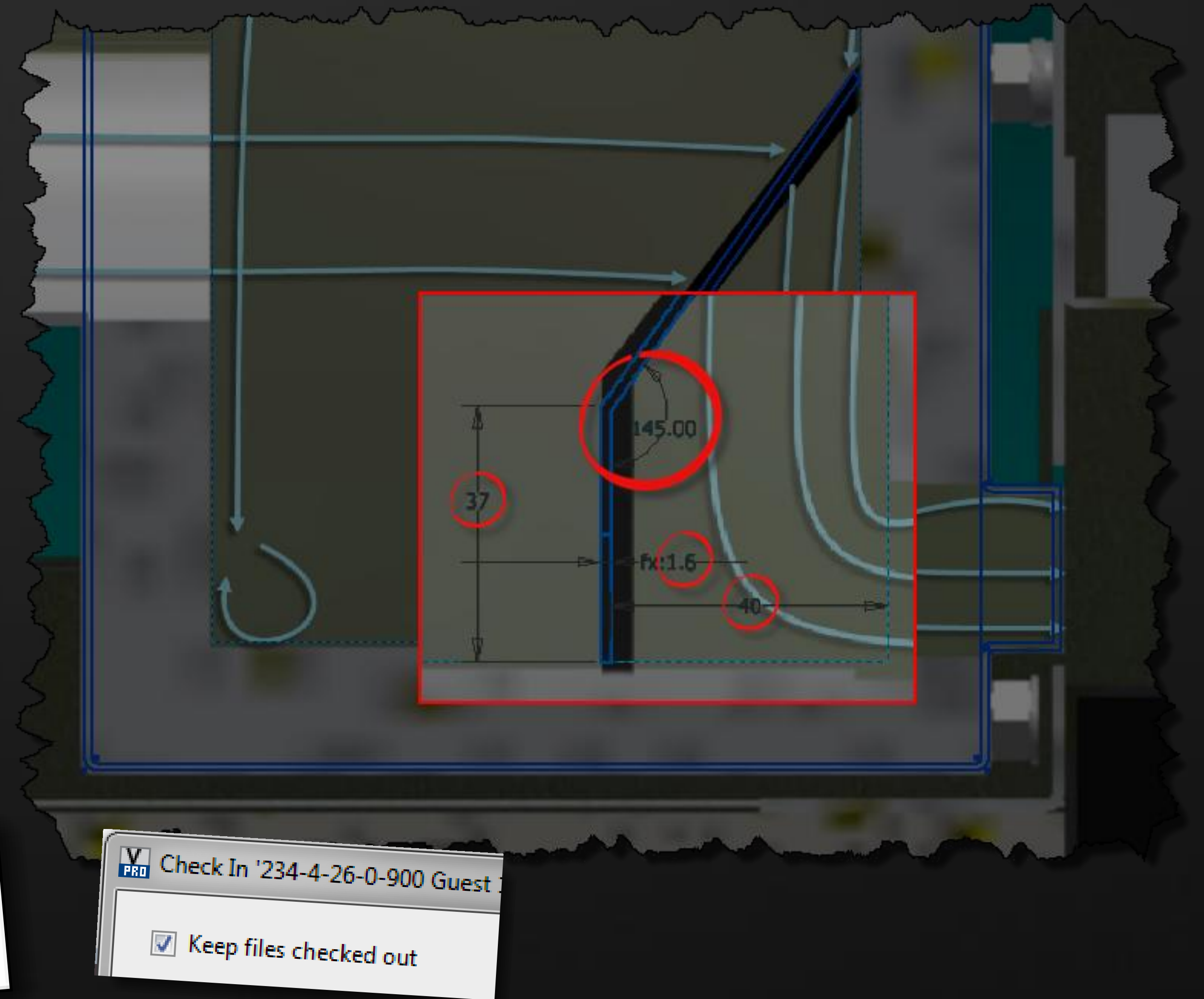
Model Plenum Concepts

- Create a template plenum
- Copy it 3 times
- Model internals
- No need to model sheet metal details yet
- Assembly constraints are maintained when model's replaced



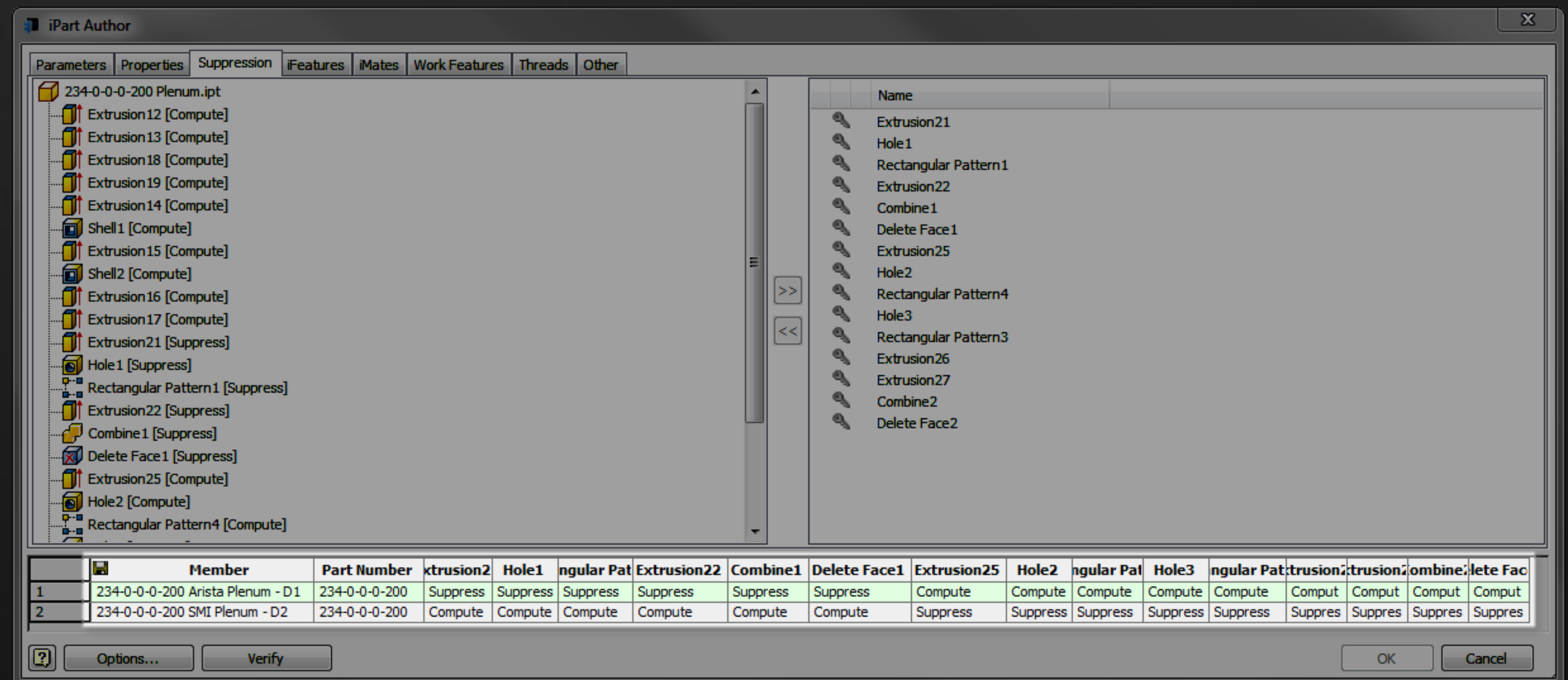
Model Plenum Concepts

- Import SBM image
- Draw replace hand drawn with CAD sketch
- Important that you use multi bodies
- Allows CFD material assignment
- Versioning with Vault



Model Plenum Concepts – iParts?

- Why no iPart configurations?
- Too many features – Table grows exponentially
- Sim CFD supports iParts & iAssemblies
- IMO its intended for Optimization WF's
- If your WF uses iParts – its perfect



Simplification

Full Data Set

- Chosen plenum included in the Ceiling Assembly
- Use plenum simulation output data
- Full room simulation
- Large amount of simplification needed
- Balance between important detail & 'water tightness'

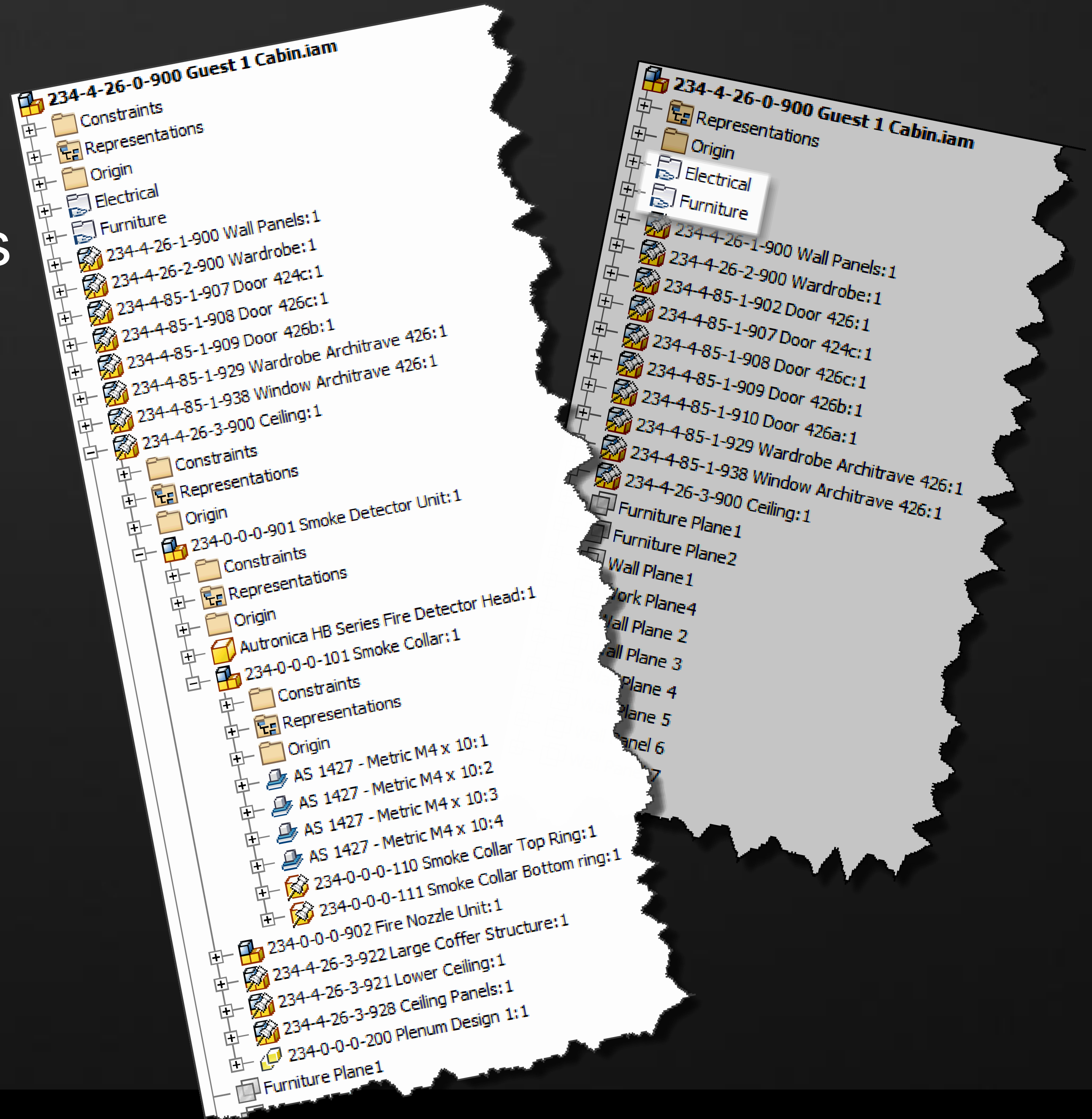


Simplification

- Organised into logical assemblies
- Use folders to organize common types

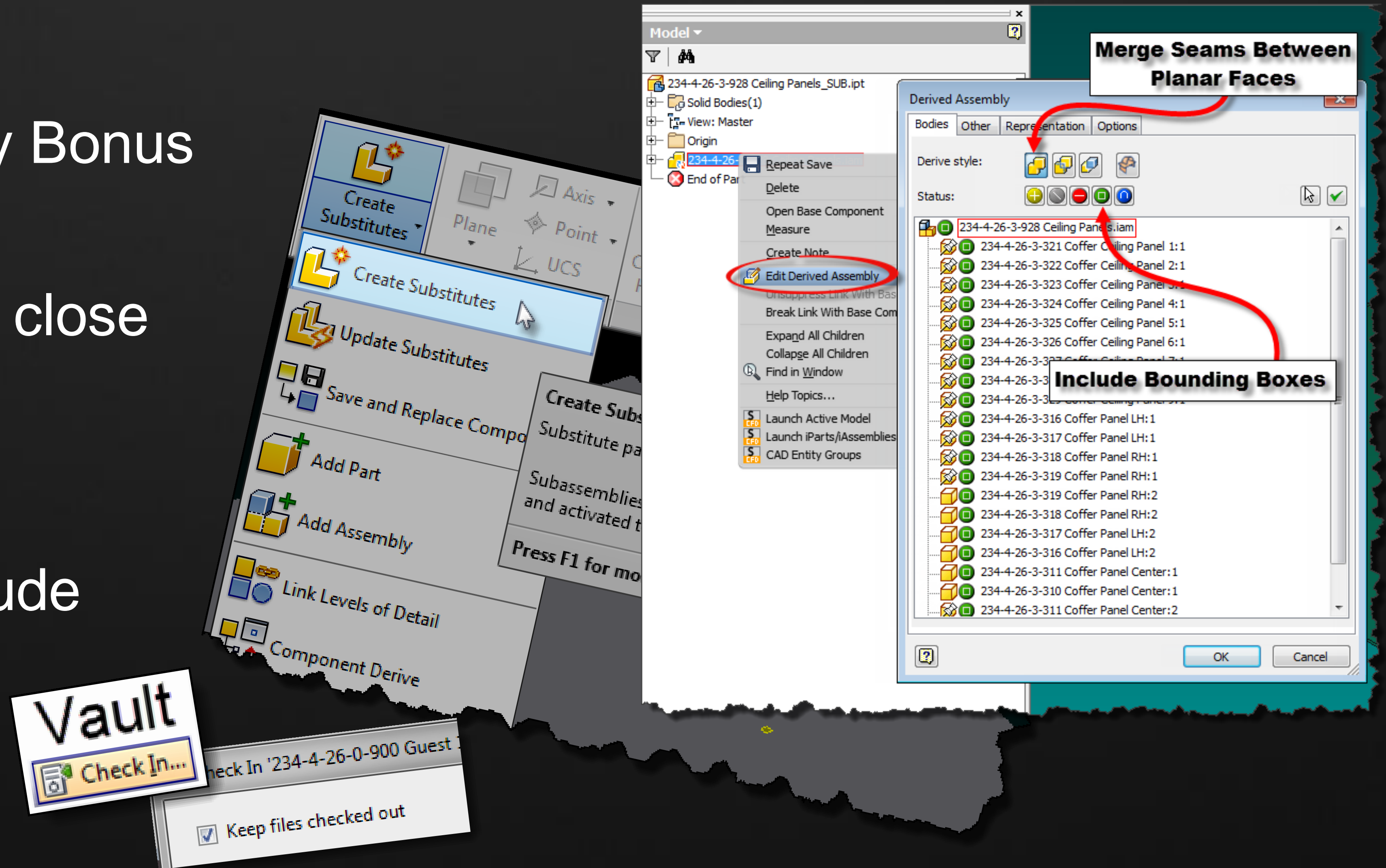
Simplification using:

- Create Substitutes
- Labs Simplification Tool
- Shrinkwrap Substitute
- Modifying the substitute parts



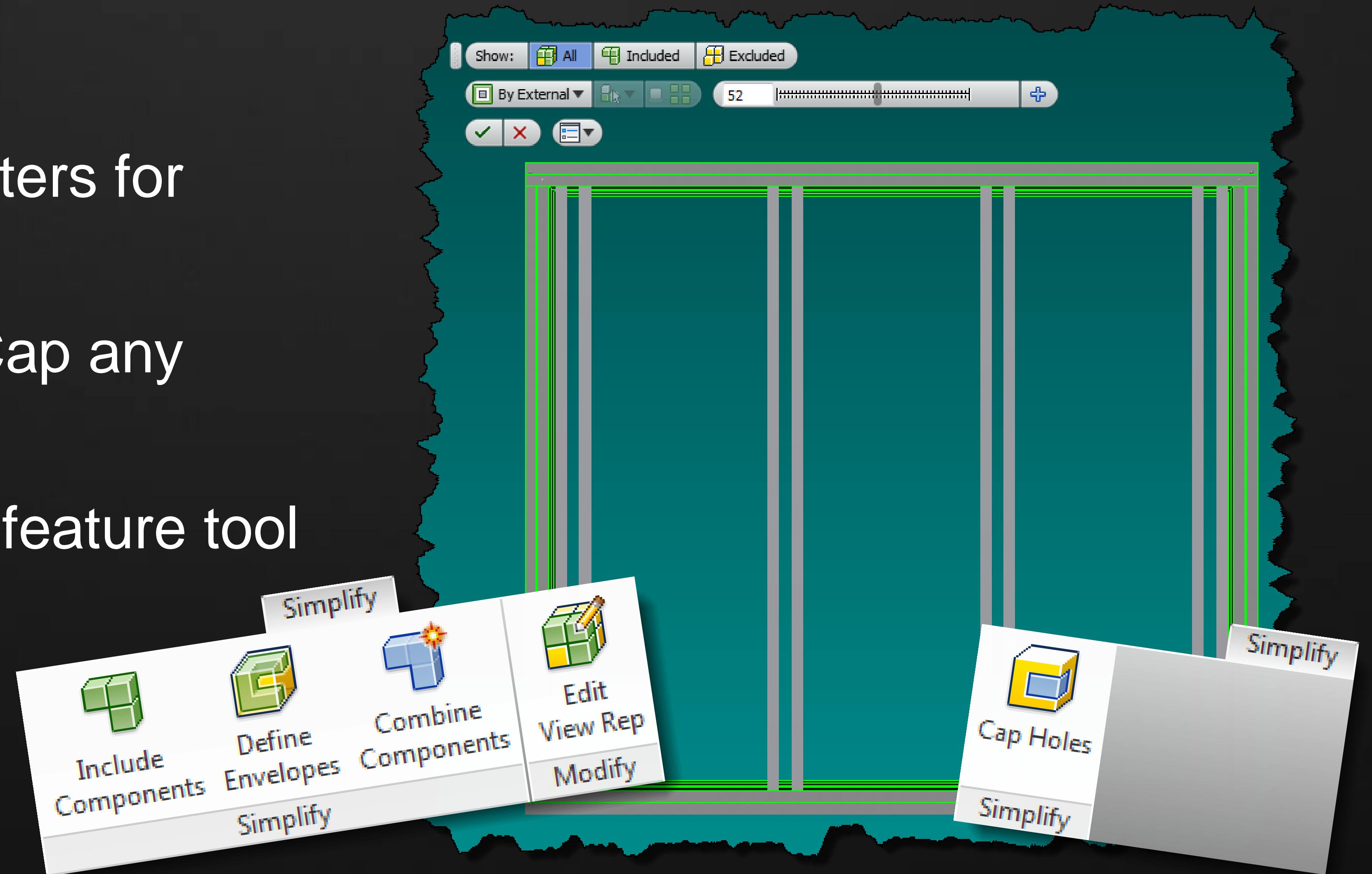
Simplification – Create Substitutes

- Found in 'Assembly Bonus Tools' Panel
- Ideal for combining close proximity parts
- Edit derived node
- Merge faces & include bounding box



Simplification – Labs Simplification

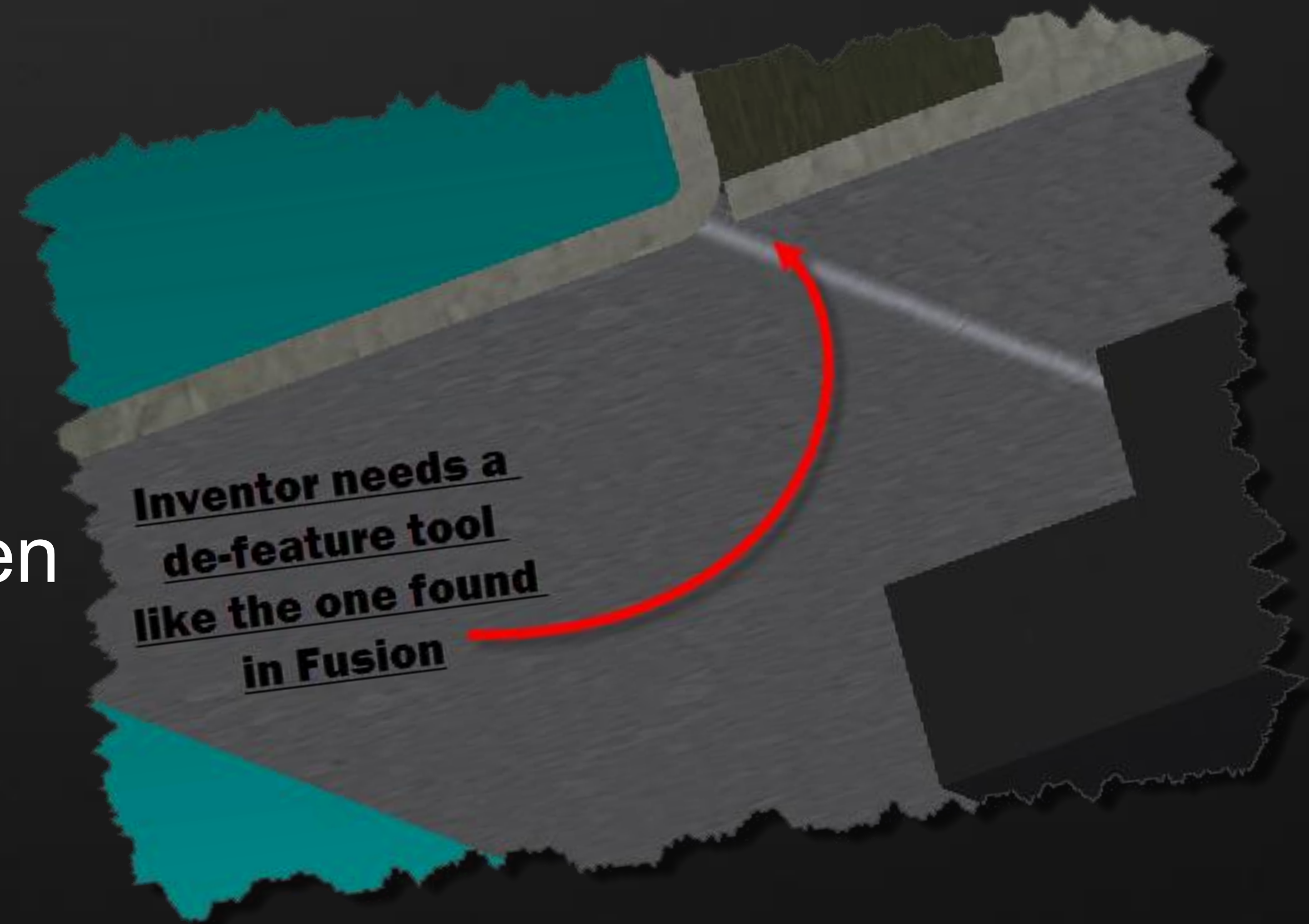
- Amazing selection filters for removing bodies
- Part environment - Cap any shape penetration
- Inventor needs a de-feature tool



Simplification – Labs Simplification

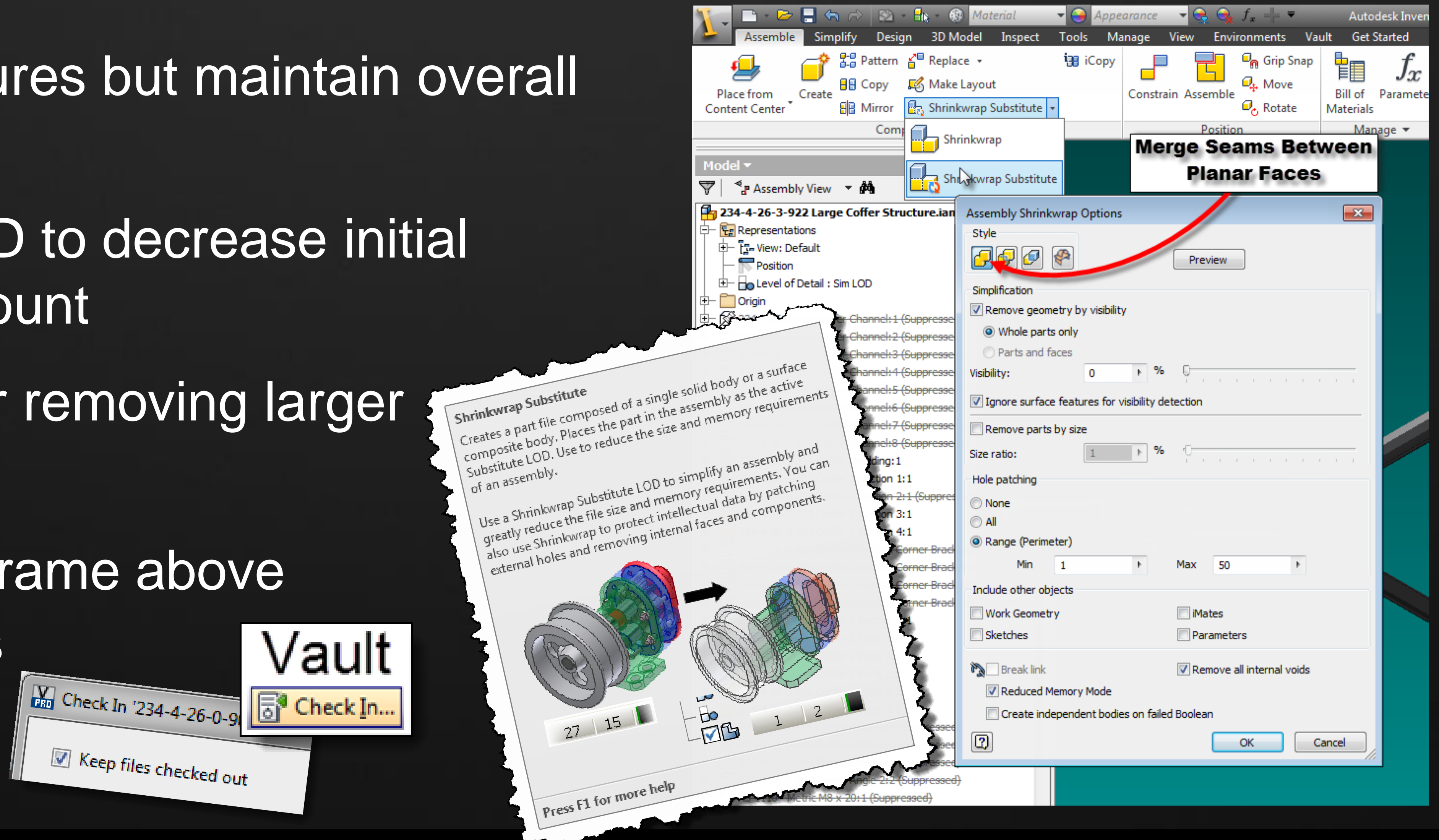
Improvement Required

1. No substitute option – Place as Reference & LOD
 2. Voids to fill? Edit derived assembly before capping holes
 3. No tool to fill ‘Open’ pockets between parts
-
- #1 meant I used LOD & Shrinkwrap Substitute instead



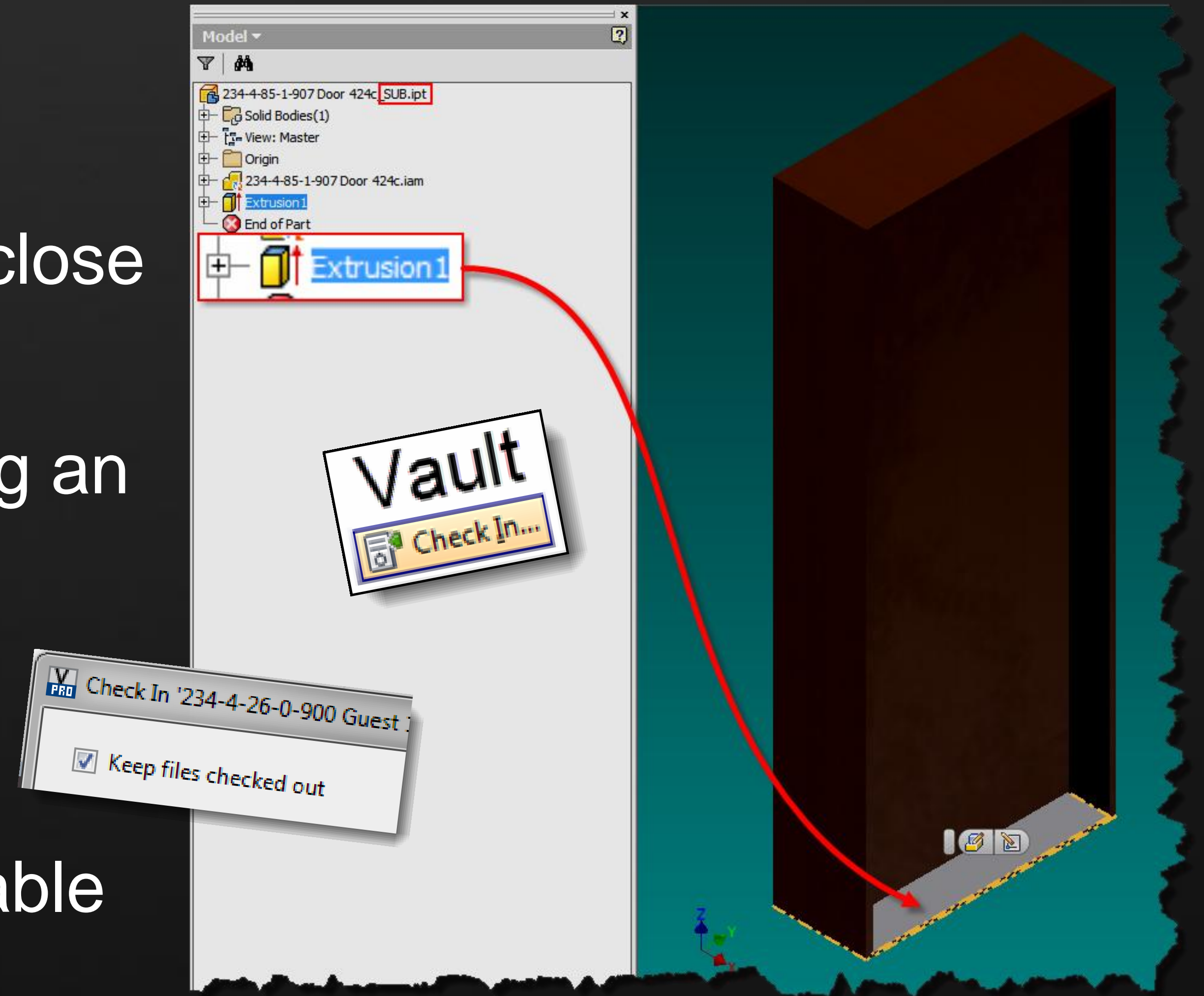
Simplification – Shrinkwrap Substitute

- Remove features but maintain overall geometry
- Start with LOD to decrease initial component count
- LOD helps for removing larger components
- Used on the frame above ceiling panels



Simplification – Substitute Part Modification

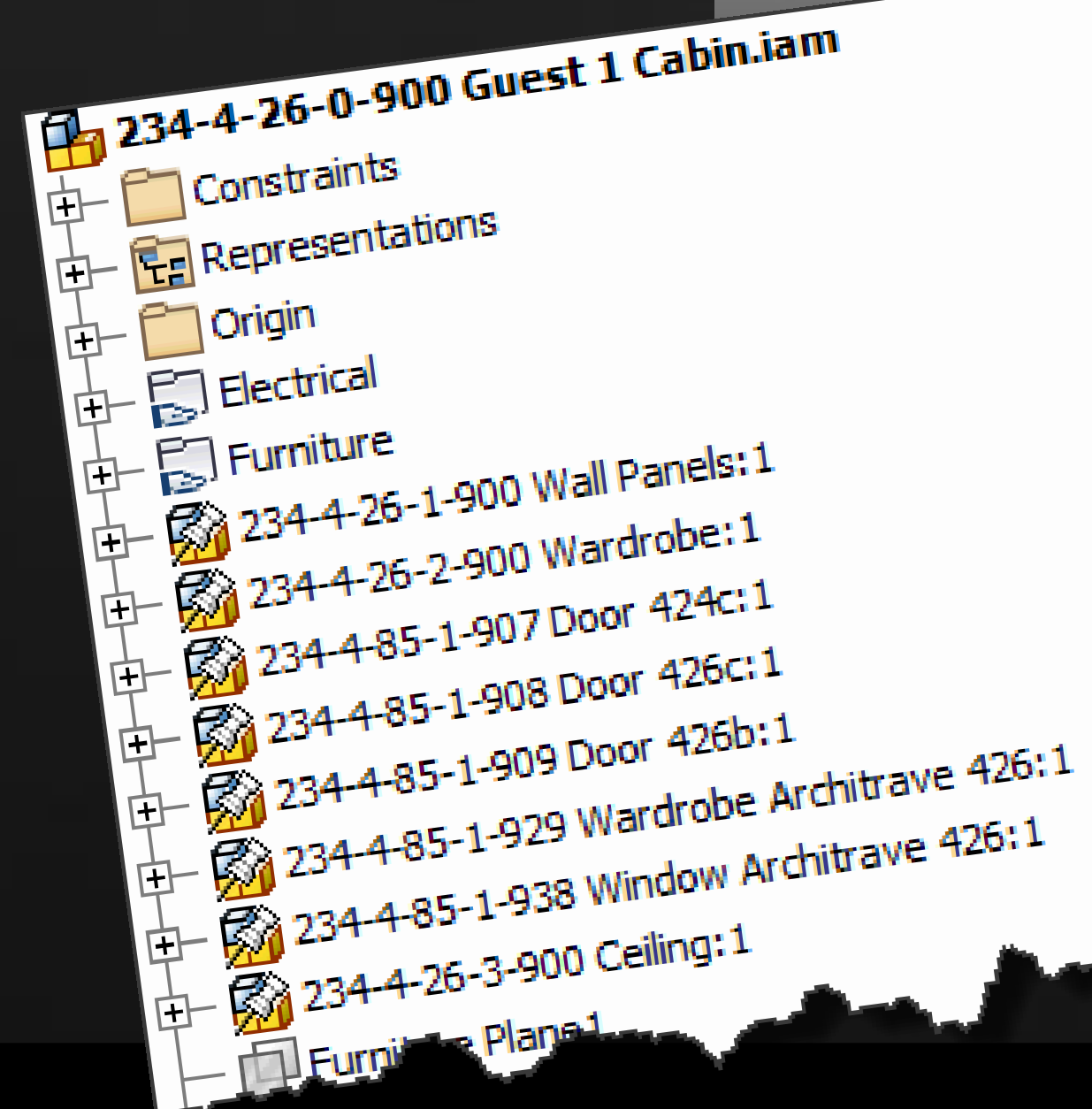
- Dealing with 'Open' penetrations
- Open Substitute & add features to close off gaps
- Section of missing floor added using an extrusion
- Only adding geometry needed for Simulation
- Update > Complete refresh > Unstable



Inventor Simplification – Results

Before

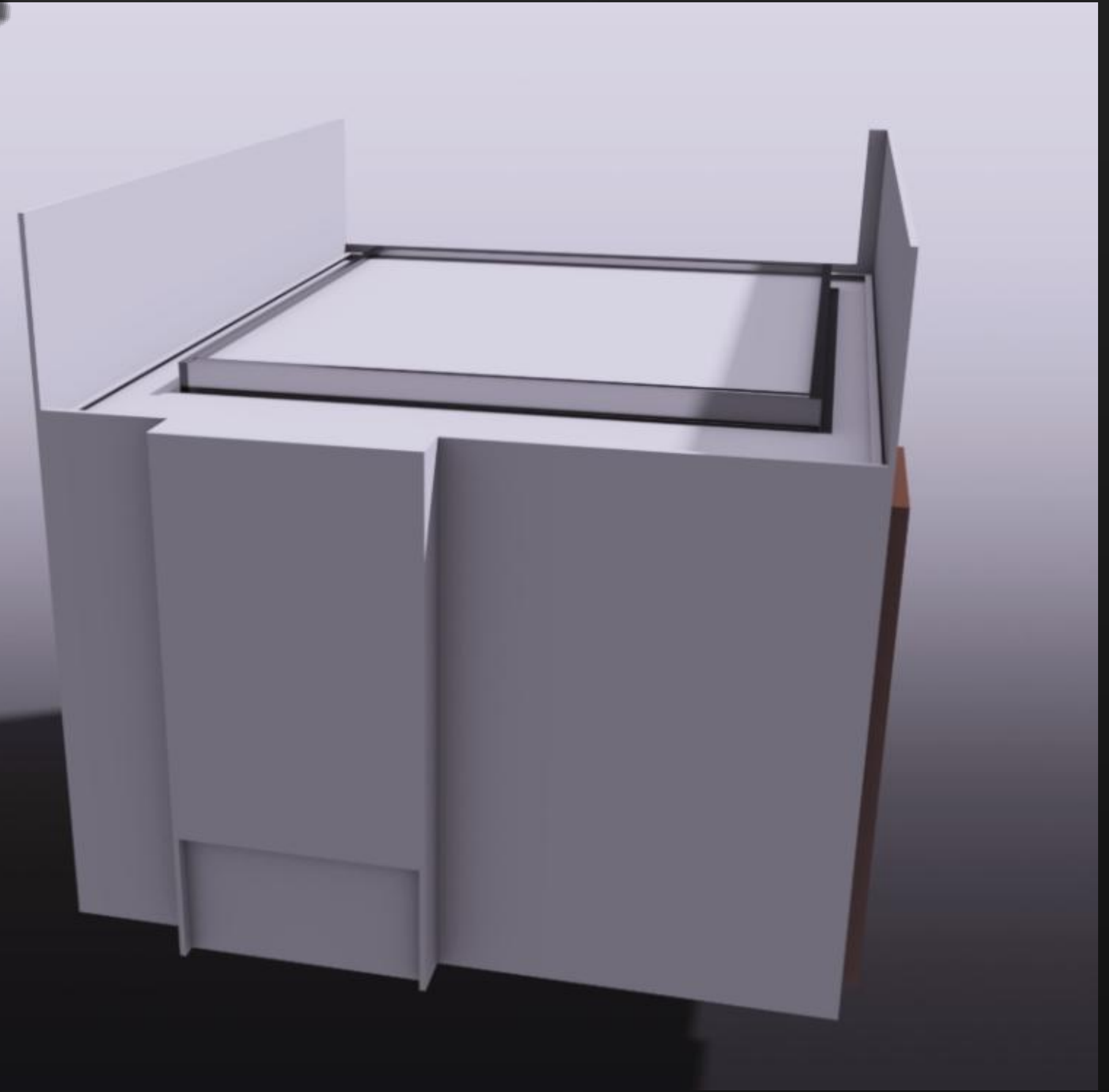
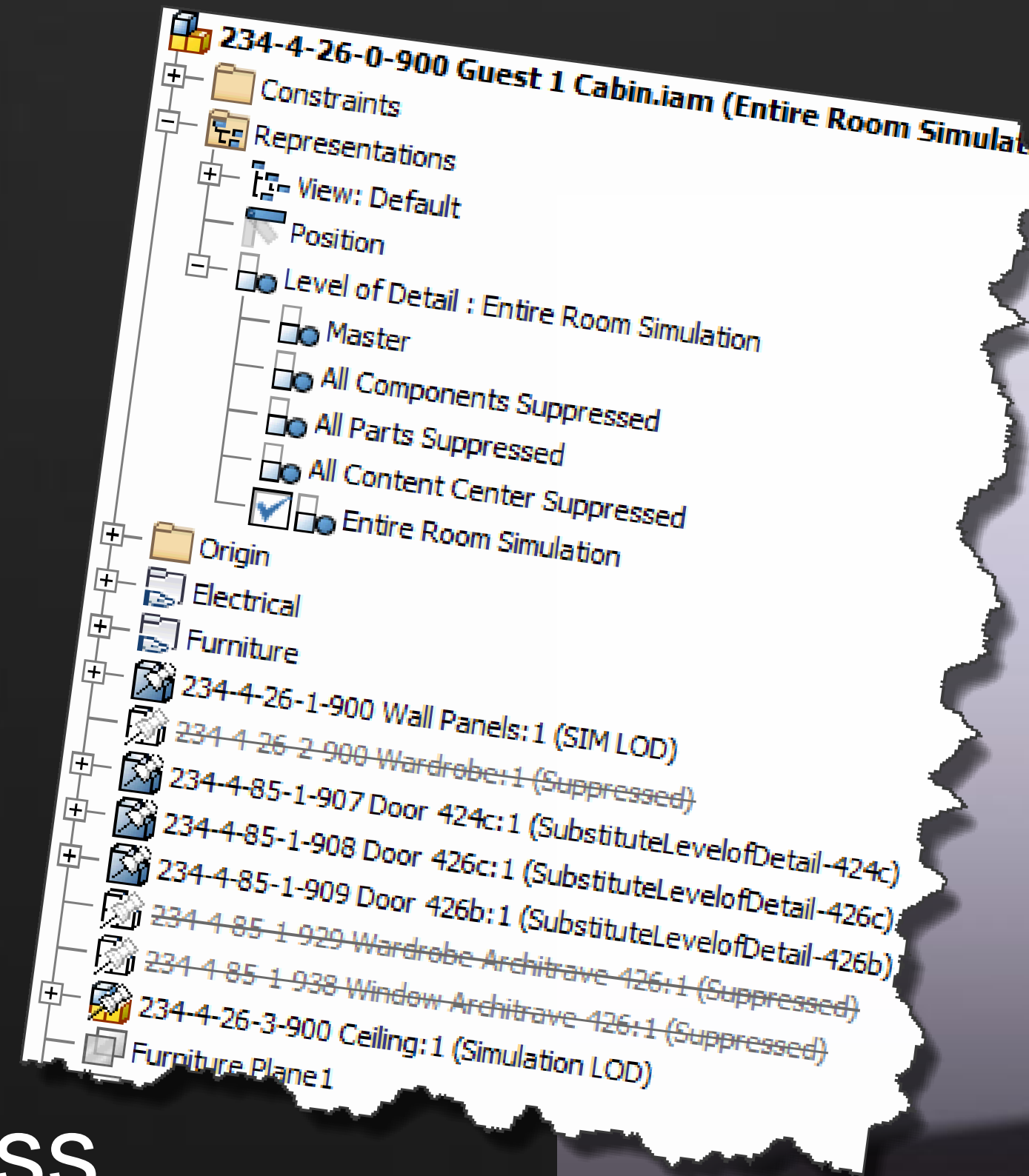
- All components active
- Loads of gaps & detail
- Zero suppressions in the model browser



Inventor Simplification – Results

After

- A lot less detail
- Lower part & surface count
- Substitutes & suppress components in model browser

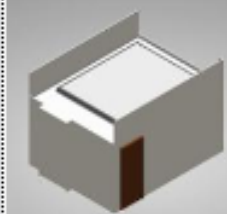
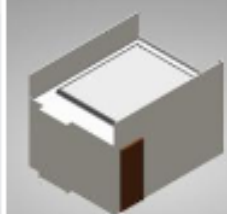




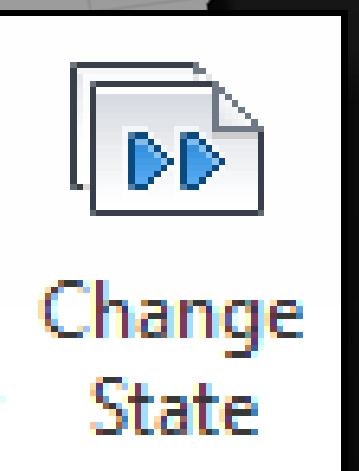
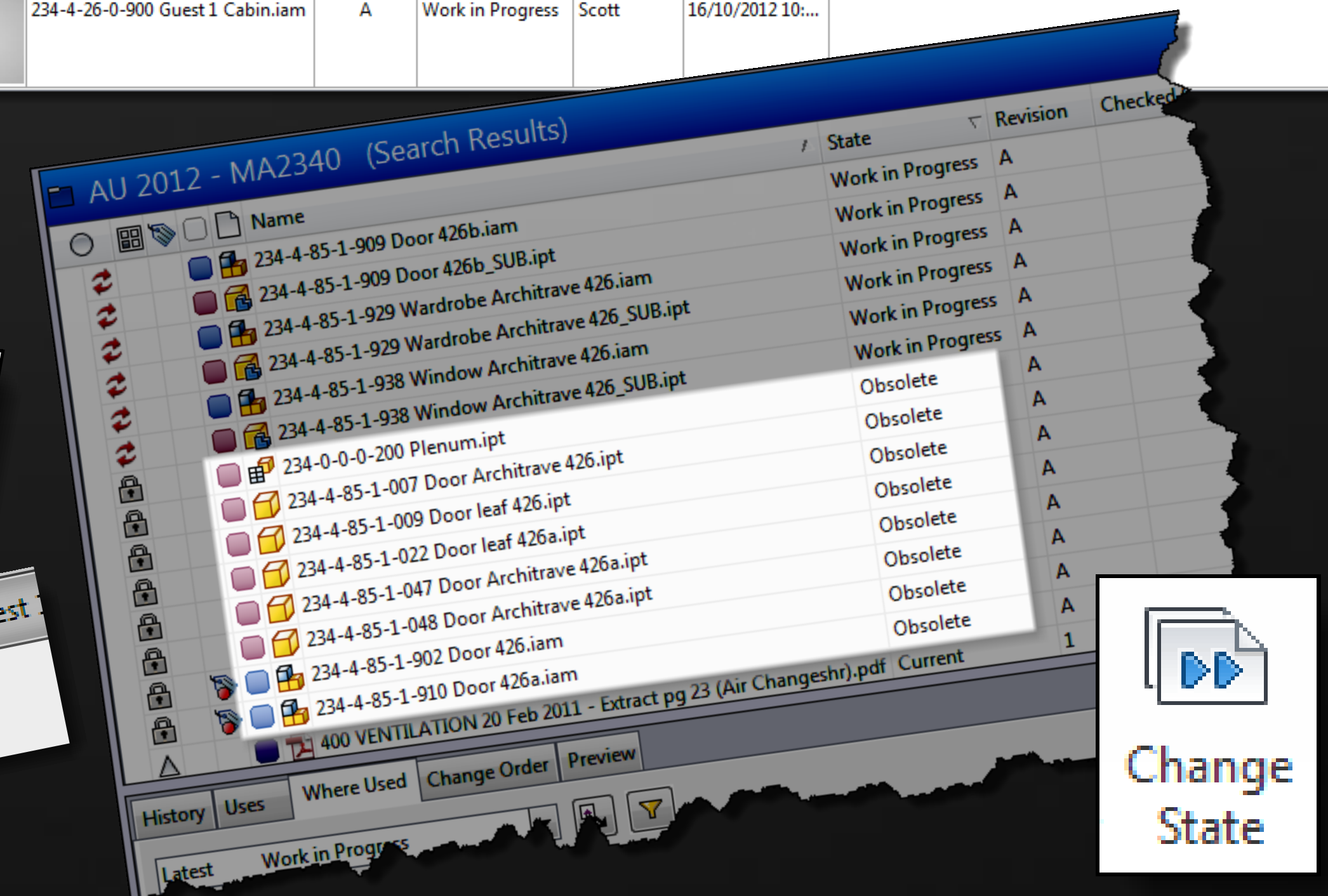
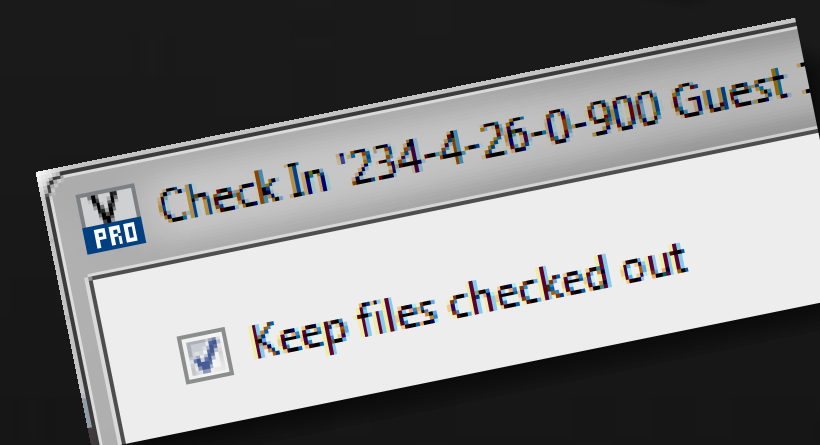
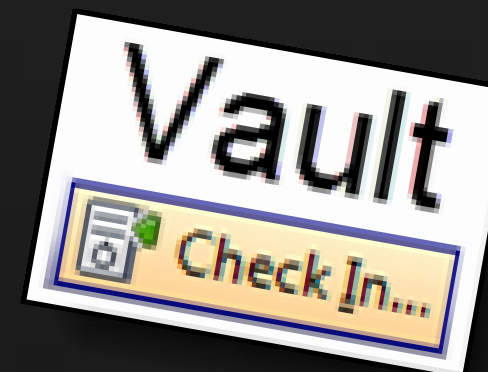
Inventor Simplification

[Simplification Video](#)

Data Management

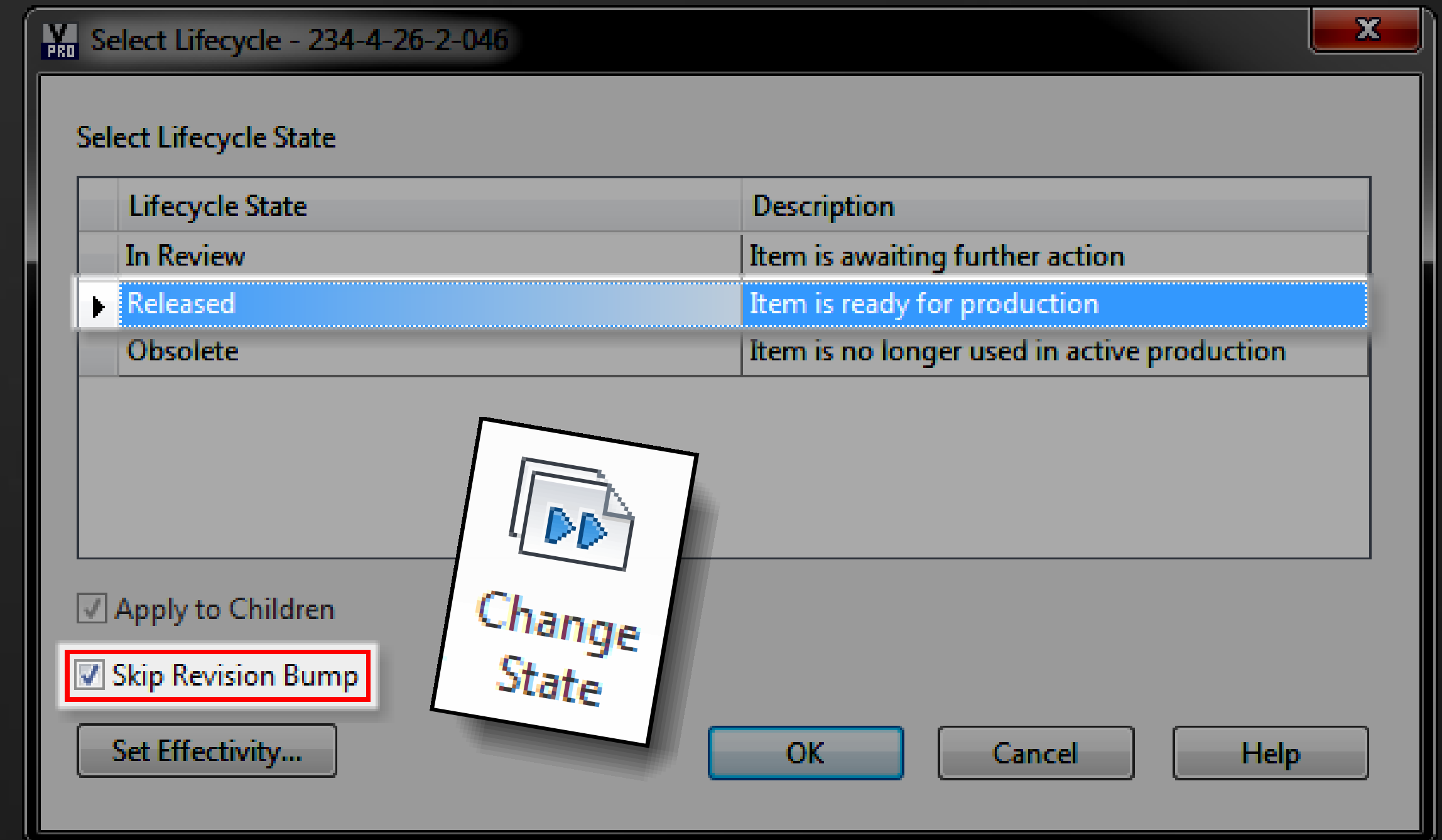
- Check In at each significant milestone
- Comment on changes & next steps
- Increased meaning & use for History tab
- Use Obsolete State instead of deleting
- Debatable if obsolete files should be visible

Thumbnail	File Name	Revision	State (Historical)	Created By	Checked In	Comment
	234-4-26-0-900 Guest 1 Cabin.iam	A	Work in Progress	Scott	28/10/2012 8:3...	Check In for Review & Pre-Release BOM sync to the PLM 360
	234-4-26-0-900 Guest 1 Cabin.iam	A	Work in Progress	Scott	28/10/2012 1:1...	Checking in the Entire Room Assembly having setup the full r...
	234-4-26-0-900 Guest 1 Cabin.iam	A	Work in Progress	Scott	25/10/2012 11:...	Checking in the Entire Room Assembly having setup all the si...
	234-4-26-0-900 Guest 1 Cabin.iam	A	Work in Progress	Scott	16/10/2012 10:...	



Pre-Release BOM

- Upload pre-release BOM to PLM 360
- Stakeholders leverage info to compress lead times
- Release Vault Item BOM > Skip Revision Bump
- Export BOM using Parent Method
- Under the Hood PLM BOM import Blog post



PLM 360 – Project WS

- Ties together the Project
- All Tasks nested under PM tab
- Relevant BOM items added to Relationships tab

Autodesk® PLM 360

Main Menu | Reports | Tools | Administration | Admin Moyse | Dashboard | Help

Project Management

PR000004 - 234 KAY

Item(s) successfully added to Relationships tab. [Show Details](#)

Project Details | Schedule (2) | Meeting Actions (0) | Change Log (8) | Relationships (2)

Item	Current State	Type of Relationship	Description
234-0-0-0-200 - Plenum [REV:A]		Cross-Reference	
234-4-26-0-900 - Guest Cabin [REV:B]		Cross-Reference	

Add Edit

This item contains all the design variations

Autodesk PLM 360 © Copyright 2012 Autodesk, Inc. All rights reserved. Privacy Policy Terms and Conditions

Autodesk® PLM 360

Autodesk® PLM 360

Autodesk PLM 360 © Copyright 2012 Autodesk, Inc. All rights reserved. Privacy Policy Terms and Conditions

Autodesk® PLM 360

Project Management

PR000004 - 234 KAY

Project Details | Schedule (2) | Meeting Actions (0) | Change Log (7) | Relationships (0)

Add Add Linked Items Edit

#	Title/Item	Start	End	Duration	Pre	Status	% Complete
1	TK000008 - Pre-Simulation Concept Selection	12/10/2012	12/10/2012	0d		[05] 100% Complete	100%
2	TK000007 - 234 KAY - Plenum CFD Study	17/10/2012	08/11/2012	22d		[01] 0% Complete	10%
Project Summary							14%

Add Add Linked Items Edit

Autodesk® PLM 360

PLM 360 – Task Assignment

- Task assignment Video

PLM 360 – Task Assignment

- Same process as Concept collaboration task
- Instruct to put Sim tasks in sub tasks tab
- Make Sim contractor Record owner
- Remember to notify them
- Attach Inventor Part Files
- Add Requirements Item to Relationships tab

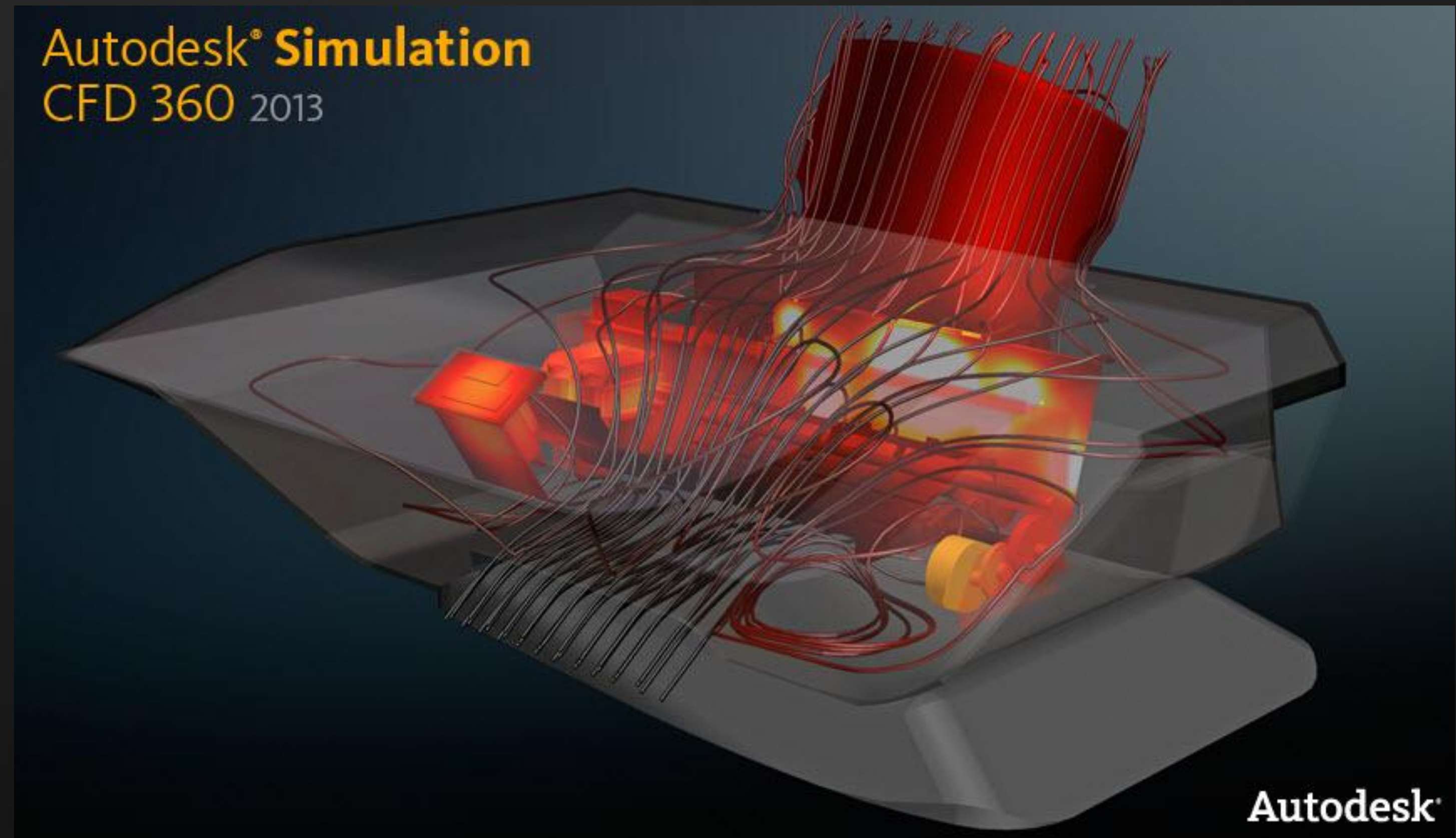
Are you sure you want to transfer ownership to the new owner?

☒ Send Notification Email

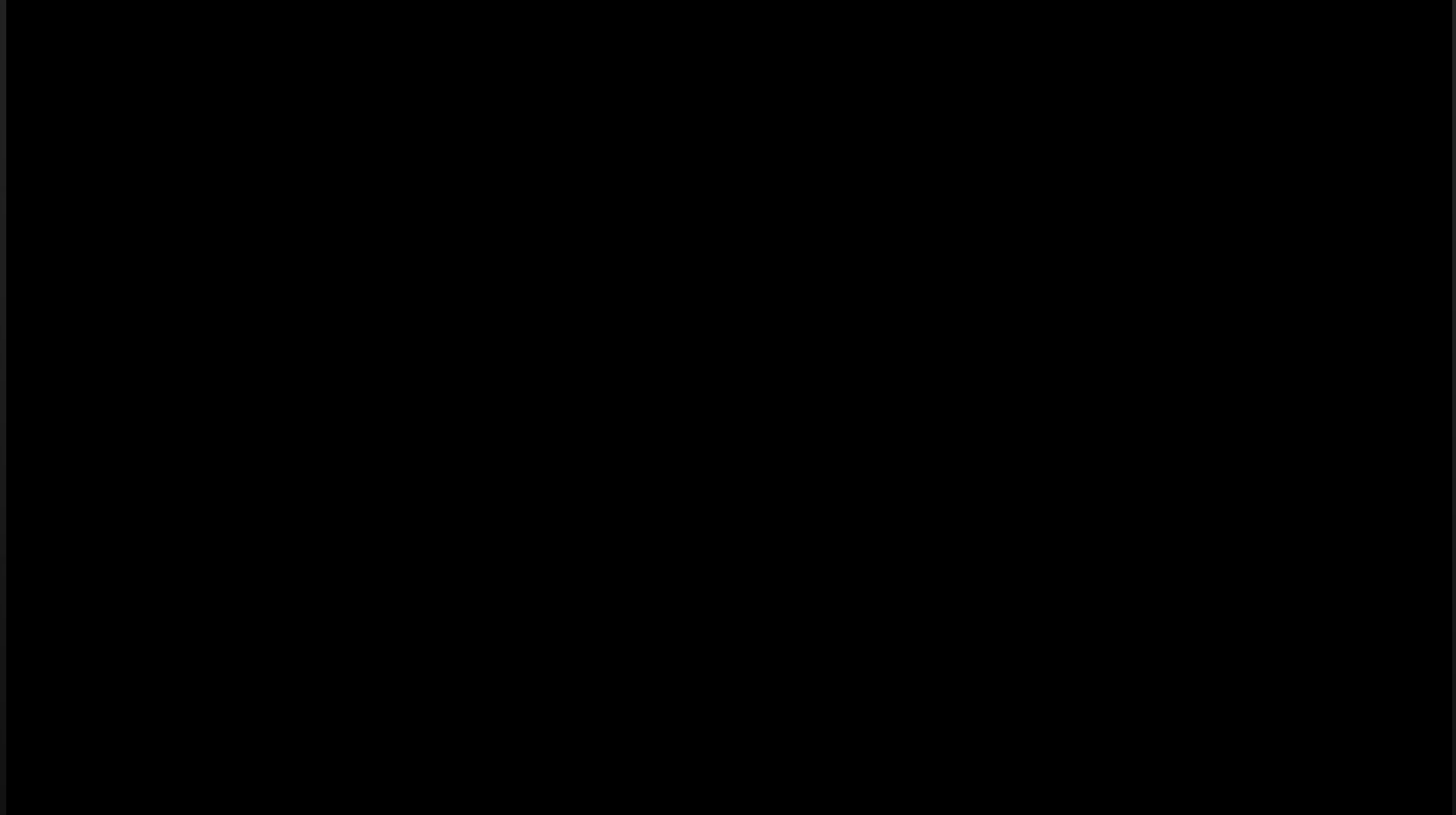
The screenshot displays the Autodesk PLM 360 web interface. At the top, the header shows 'Autodesk® PLM 360' with user 'Admin Moyse' and navigation links for 'Dashboard' and 'Help'. Below the header is a main menu with 'Main Menu', 'Reports', 'Tools', and 'Administration'. The central area is titled 'Tasks' and shows a specific task: 'TK000007 - 234 KAY - Plenum CFD Study'. The task status is '[01] 0% Complete'. A tabbed interface below the title includes 'Task Details' (selected), 'Sub Tasks (3)', 'Notes (0)', 'Attachments (3)', 'Milestones (0)', 'Workflow Actions', 'Relationships (4)', and 'Change Log (43)'. An 'Edit' button is visible. The 'Details (1 of 4)' section shows the task ID 'TK000007', title '234 KAY - Plenum CFD Study', and a description: 'Use the models attached & setup the simulation using the parameters described in the requirements item. When you create you Simulation Tasks Item please make sure your add them to this Item's Sub Tasks tab'. Below this is a section titled 'Owner and Change Summary' which lists: Owner 'Simulation Contractor [change]', Additional Owners '[change]', Created by 'Admin Moyse', Created on '17/10/2012 12:01:35 AM', Last Modified by 'Simulation Contractor', and Last Modified on '29/10/2012 7:07:17 AM'. An 'Edit' button is at the bottom of this section. The footer contains copyright information for Autodesk PLM 360 © 2012 and links to 'Privacy Policy' and 'Terms and Conditions', along with the 'Autodesk® PLM 360' logo.

Autodesk Simulation CFD 360

- PLM 360 Simulation Workflow
- Simplification / Defeaturing
- Simulation CFD 360
- Vault Strategies



Workflow Demonstration



The Simulation Task

- Provides customizable workspace per my organization
- Defeaturing / Simulation / Review workflow
- Provides automation for reporting and notification

The screenshot displays the 'Simulation Tasks' interface for a specific task: 'STK000018 - SMI Plenum Evaluation Type 2 (Small Bent)'. The interface includes a top navigation bar with icons for adding, deleting, and other actions, along with a search bar. Below the task title, there's a 'State' indicator showing '[5] Reporting'. A horizontal menu allows switching between 'Task Details', 'Notes (1)', 'Attachments (0)', 'Milestones (4)', 'Workflow Actions', 'Change Log (28)', 'Relationships (3)', 'Linked Items (0)', and 'Project Management (0)'. The 'Attachments' section is active, showing a list of files and their associated items. A workflow diagram on the right illustrates the process steps: [1] Meeting & Admin, [2] Model Preparations / DeFeaturing, [3] Scenario Prep & Run, [4] Review Results, [5] Reporting (highlighted in green), and [6] Closed. Arrows indicate the flow between these steps, with labels like 'Begin Meeting and Requirements', 'Begin Model Prep', 'Begin Scenario Prep', 'Log & Review Results', 'Begin Report', and 'Final Approval'.

Simulation Tasks

STK000018 - SMI Plenum Evaluation Type 2 (Small Bent)

State [5] Reporting

Task Details Notes (1) Attachments (0) Milestones (4) Workflow Actions Change Log (28) Relationships (3) Linked Items (0) Project Management (0)

Drag and drop files here or click Upload. Upload...

Attachments Zip & Download all

Shortcuts to Related Attachments	Attached to Item
400 VENTILATION 20 Feb 2011 - Extract pg 23 (Air Changeshr)	RE000019 - Client's performance specs - Customer [REV:1]
H&H airflow calcs	RE000019 - Client's performance specs - Customer [REV:1]
Z-301-1-VB-11	RE000019 - Client's performance specs - Customer [REV:1]
1210SM D2-1 Convergence Data	SAR000025 - SMI Plenum Evaluation Type 2 (Small Bent) - D2-1
1210SM D2-1 Convergence Plot	SAR000025 - SMI Plenum Evaluation Type 2 (Small Bent) - D2-1
1210SM D2-1 CSA Prs	SAR000025 - SMI Plenum Evaluation Type 2 (Small Bent) - D2-1
1210SM D2-1 CSA Vel	SAR000025 - SMI Plenum Evaluation Type 2 (Small Bent) - D2-1
1210SM D2-1 CSB Prs	SAR000025 - SMI Plenum Evaluation Type 2 (Small Bent) - D2-1
1210SM D2-1 CSB Vel	SAR000025 - SMI Plenum Evaluation Type 2 (Small Bent) - D2-1
1210SM D2-1 Outlet Prs data	SAR000025 - SMI Plenum Evaluation Type 2 (Small Bent) - D2-1
1210SM D2-1 Outlet Prs plot	SAR000025 - SMI Plenum Evaluation Type 2 (Small Bent) - D2-1
1210SM D2-1 Outlet Vel data	SAR000025 - SMI Plenum Evaluation Type 2 (Small Bent) - D2-1
1210SM D2-1 Outlet Vel plot	SAR000025 - SMI Plenum Evaluation Type 2 (Small Bent) - D2-1
1210SM D2-1 Traces Plot	SAR000025 - SMI Plenum Evaluation Type 2 (Small Bent) - D2-1
2012-11-09 SMI Plenum Analysis Summary	TK000007 - 234 KAY - Plenum CFD Study
234-0-0-0-200 Plenum Design 1	TK000007 - 234 KAY - Plenum CFD Study
234-0-0-0-200 Plenum Design 2	TK000007 - 234 KAY - Plenum CFD Study
234-0-0-0-200 Plenum Design 3	TK000007 - 234 KAY - Plenum CFD Study

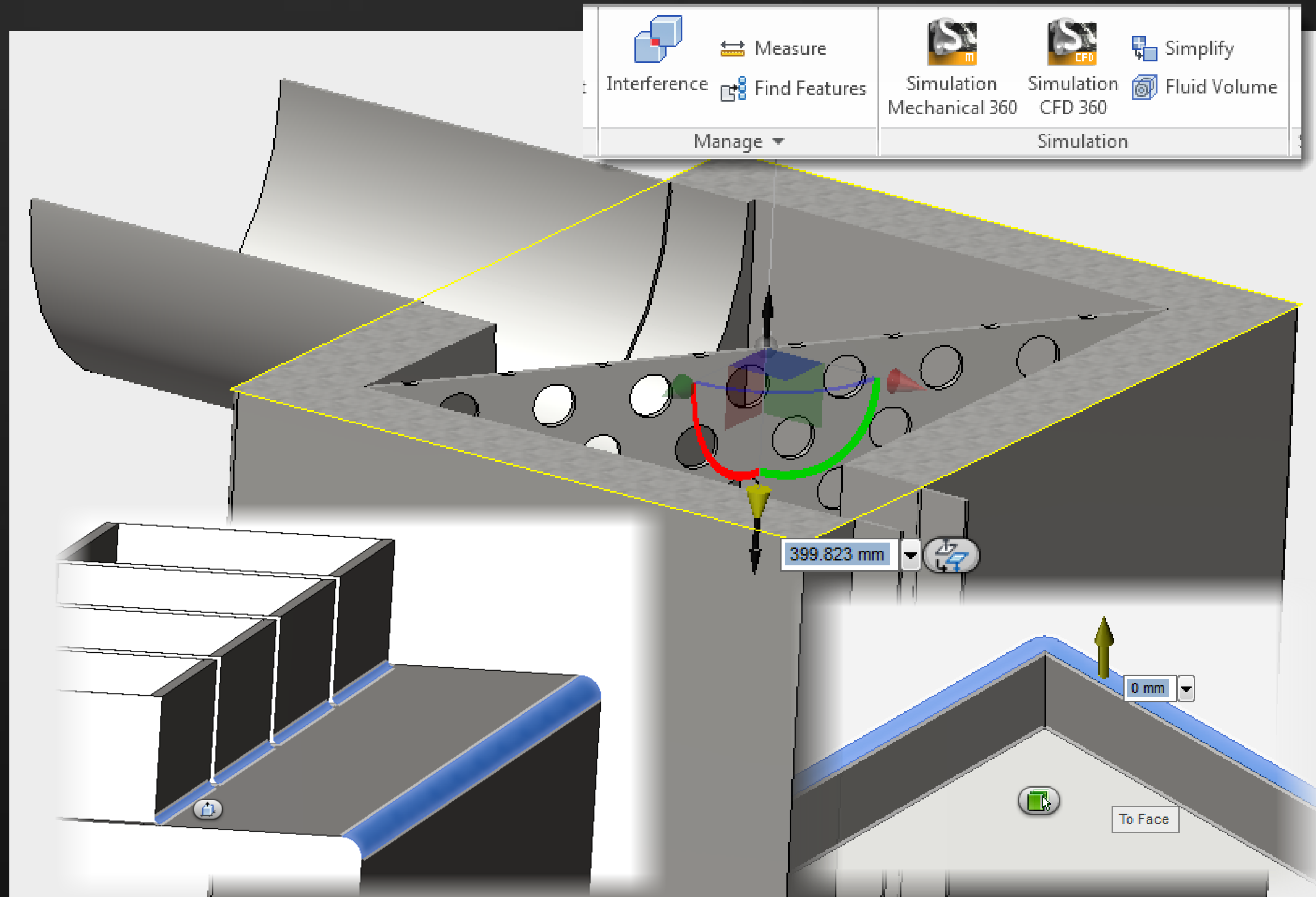
Attachment & Details

File Info	Status
-----------	--------

Autodesk PLM 360

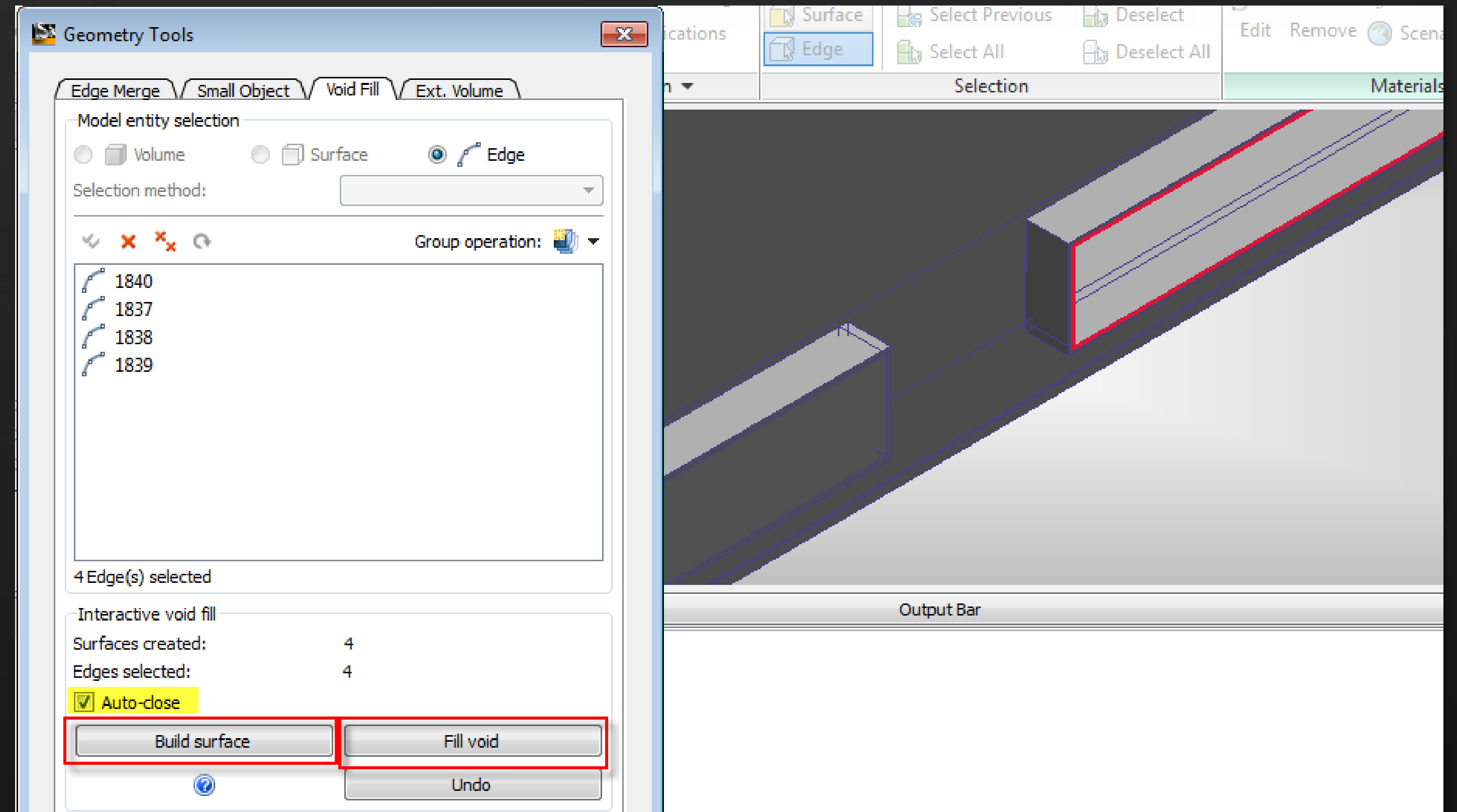
Fusion Defeaturing / Simplification

- Delete Key Removes selected features
- Push / Pull to remove protrusions
- Sections permit internal access
- Find Features & Simplify Tools



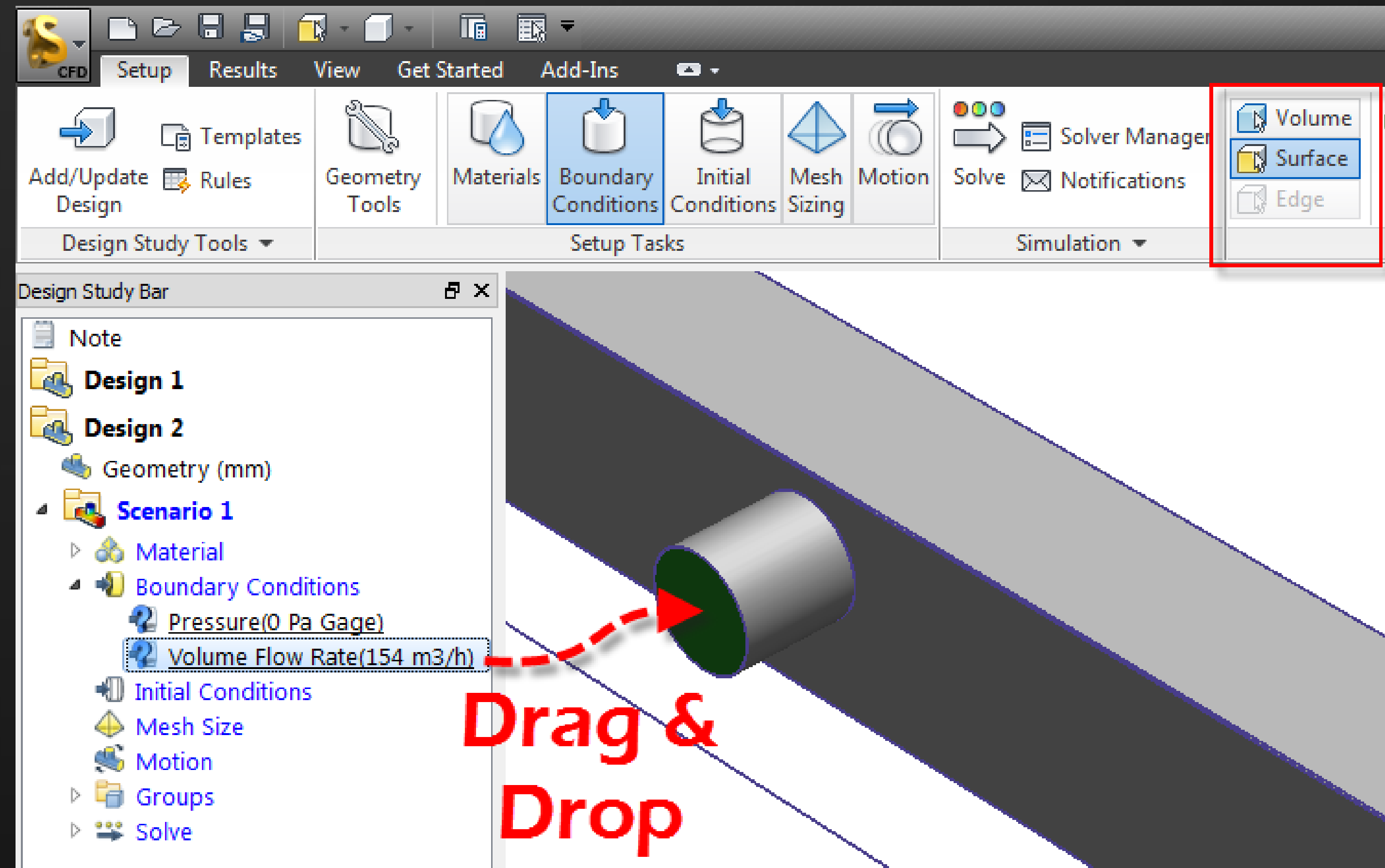
CFD Model Preparation Tools

- Remove small features
- Seal off voids with surfaces
- Fill internal fluid volume
- Create external fluid region



Simulation CFD Setup

- Materials, Boundary / Initial Conditions, & Meshing
- Drag & Drop conditions onto model
- Use templates
- Mesh size strategies



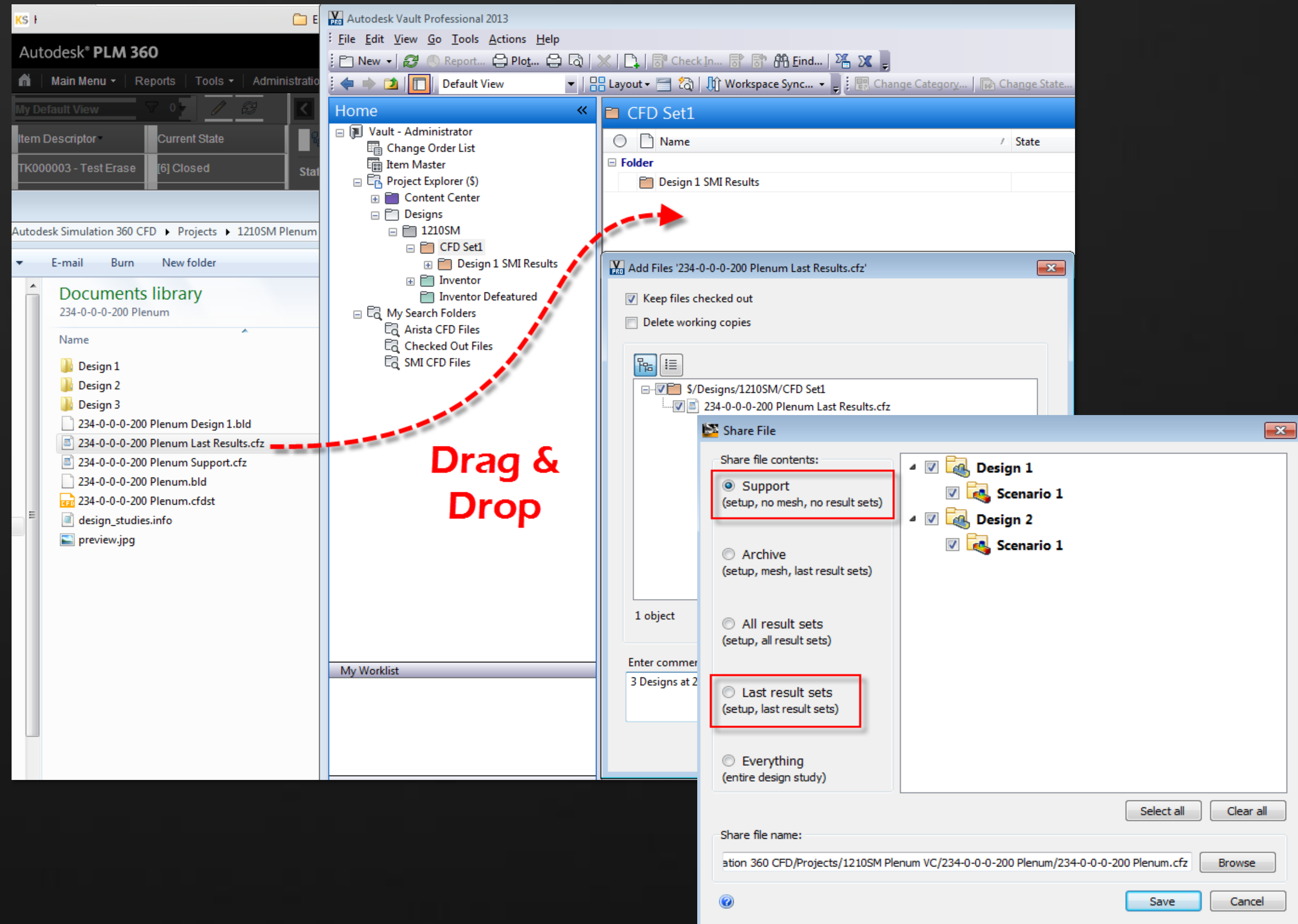
Simulation CFD 360 Solving

- Sends model and setup to cloud solver
- Send multiple Designs and Scenarios simultaneously
- Continue working during solve
- Simulation Job Manager

Simulation Job Manager				
Job Status File Transfers				
Job	Status	Message	Progress %	Time
Simulation CFD 360 2013				
In progress				
234-0-0-0-200 Plenum/Design 1/Scenario 1	Finished			Oct 28 10:21 AM
234-0-0-0-200 Plenum/Design 2/Scenario 1	Finished			Oct 28 10:31 AM
234-0-0-0-200 Plenum/Design 3/Scenario 1	Finished			Oct 28 10:57 AM
234-0-0-0-200 Plenum/Design 1/Scenario 1	Running	Download		Oct 28 9:21 PM
234-0-0-0-200 Plenum/Design 2/Scenario 1	Finished			Oct 28 10:17 PM
234-0-0-0-200 Plenum/Design 3/Scenario 1	Running	Upload		Oct 28 10:26 PM
Recent				
1210SM SMI PLENUM SET 1/Design 2 Arista/Scenario 1	Finished			Oct 24 9:31 PM
1210SM SMI PLENUM SET 1/Design 2 Arista/Scenario 1	Finished			Oct 25 5:28 AM
234-0-0-0-200 Plenum/Design 2/Scenario 1	Finished			Oct 25 7:09 AM
234-0-0-0-200 Plenum/Design 1/Scenario 1	Finished			Oct 25 1:42 PM
Archive				

Simulation CFD 360 Vault Strategies

- No Vault Client... yet
 - 2014 should contain one
- Use Share Files to archive
 - Incremental or Separate?
- Drag & Drop transfer



PLM 360 Simulation Analysis Review item

- Simple strategy for simulation type iterative reviewing
- Cloned Design Review
- Automated Scenario by Scenario
- Complete Scenario perspective

The screenshot displays the 'Simulation Analysis Review' window for item 'SAR000021 - SMI Plenum Evaluation Ver 1 (SMI Diag) - D1-1'. The state is '[01] In-Progress'. The left sidebar shows navigation options: Item Details, Associated Item Masters (0), Attachments (12), Workflow Actions, Relationships (1), Milestones (0), and Change Log (49). The main content area shows a list of attachments, all marked as 'Checked IN'.

File Name	Description	File Type	File Size	Version	Timestamp	By	At	Thumbnail
1210SM D1-1 Convergence Data.csv	Convergence Data	Miscellaneous File Type	47851	1	31/10/2012 7:48:48 AM	Simulation Contractor	31/10/2012 7:48:48 AM	
1210SM D1-1 Convergence Plot.jpg	Convergence Plot	JPEG Image	120786	1	31/10/2012 7:48:49 AM	Simulation Contractor	31/10/2012 7:48:49 AM	
1210SM D1-1 CSA Prs.jpg	Primary Cross Section Pressure Image	JPEG Image	215209	1	31/10/2012 7:48:51 AM	Simulation Contractor	31/10/2012 7:48:51 AM	

PLM 360 Collaboration and Cleanup

- PLM 360
 - Attach Report to Client's Task
 - Close Simulation Tasks
- Vault Professional
 - Check-in Project Files
 - Release
- Send a thank you note and Invoice 😊

Tasks

TK000007 - 234 KAY - Plenum CFD Study

State [01] 0% Complete

Task Details Sub Tasks (3) Notes (0) **Attachments (4)** Milestones (0) Workflow Actions Change Log (45)

Drag and drop files here or click Upload. Upload...

▼ Attachments [Zip & Download all](#)

Shortcuts to Related Attachments	Attached to Item
400 VENTILATION 20 Feb 2011 - Extract pg 23 (Air Changeshr)	RE000019 - Client's performance specs - Customer [REV:1]
H&H airflow calcs	RE000019 - Client's performance specs - Customer [REV:1]
Z-301-1-VB-11	RE000019 - Client's performance specs - Customer [REV:1]

▼ Attachment & Details [Zip & Download all](#)

File Info

[2012-11-09 SMI Plenum Analysis Summary](#)

File Name	2012-11-09 SMI Plenum Analysis Summary.docx
Description	CFD Airflow Analysis Summary Report
File Type	Microsoft Word
File Size	404976
Version	1
Timestamp	09/11/2012 12:55:00 PM

[234-0-0-200 Plenum Design 1](#)

File Name	234-0-0-200 Plenum Design 1.ipt
Description	Concept 1
File Type	Miscellaneous File Type

SMI Plenum Analysis Summary

Date: 11/09/2012
To: Scott Moysa
SMI Group
PO Box 1929
Whangarei 0140
NEW ZEALAND
tel: +61 9 438 3859

Re: Airflow analysis of the SMI Plenum set

Dear Mr. Moysa,

Thank you for submitting your project to me for review. The design is quite nice, and I believe it will increase productivity and perform well with the limitation you have.

After substantial analysis of your designs, I would submit that there is one area that might be a useful alteration:

- Possibly rounded internal diffuser; easier to assemble and less steps in manufacturing.

All designs performed within expectations; however performance benefits are difficult to measure at the rated flow. The complete analysis reports accompany this document, and are attached hereto. The summary of these analyses are as follows:

Airflow analysis of the three (3) SMI Plenums, rectangular box type, with 3 inlets and 4 outlets, 8800. The only differentiations are in their internal diffuser and baffle arrangement:

- Type 1 - Diagonal Diffuser style
- Type 2 - Mid-plenum, large bent Diffuser style
- Type 3 - Small, outlet placed bent Diffuser style

Summarized review objectives:

- Fresh Air Supply 462m³/hr @ max velocity of 5 m/s
- Review for even spread and best flow characteristics

Materials

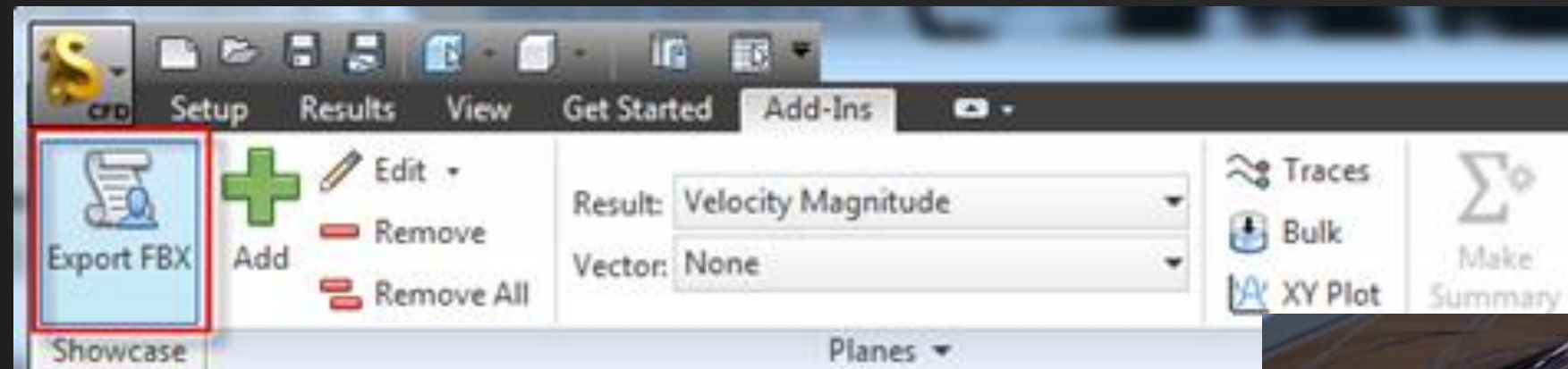
All components were studied using the manufacturer's supplied specifications:

Manufacturer: BuXXX Metals Co.

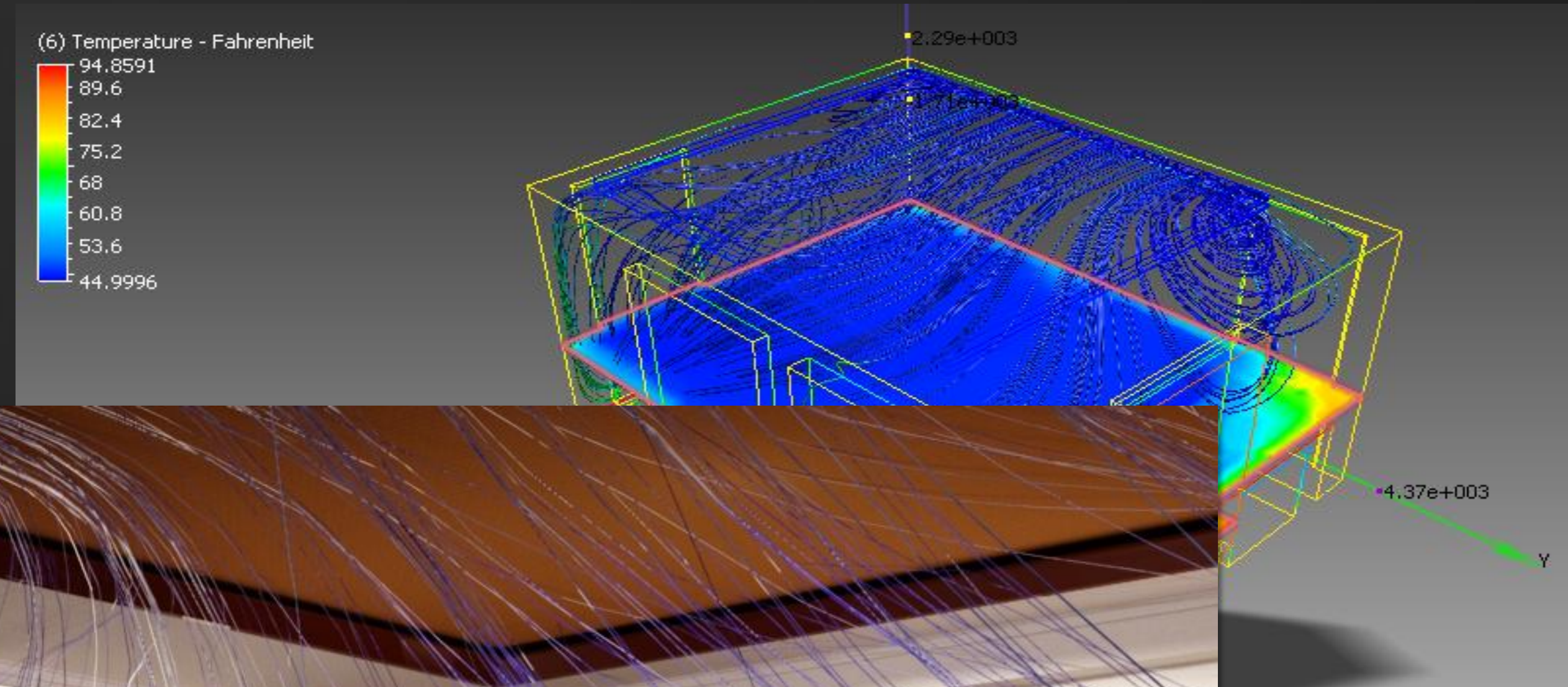
John Ev...

218 Cook Street, Nioville, Florida 32578 USA - 850-325-0533

Full Room Visualization



- Export Results from Simulation products
- Import FBX file into Showcase
- Powerful new method available for conveying message



PLM 360 Workspace Creation

- Create Survey Workspace

Contact Info



john@johnnevansdesign.net

scott_moyse1@hotmail.com



@scottmoyse @JohnEvansDesign



- Please remember to fill in the Survey

